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WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES--ETC(U)
JAN 64

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1 OF 3
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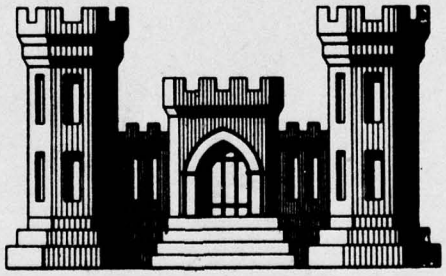
INTERIM REPORT NO. 2

WABASH RIVER BASIN COMPREHENSIVE STUDY

INDIANA, ILLINOIS AND OHIO

COVERING RESERVOIR SITES
ON
EMBARRASS RIVER, ILLINOIS
AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA



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INTERIM REPORT NO. 2
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EMBARRASS RIVER, ILLINOIS
AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA

Volume II.

APPENDIX A

DETAILED ESTIMATE OF FIRST COSTS AND ANNUAL COSTS

JANUARY 1964

1/B

INTERIM REPORT NO. 2
WABASH RIVER BASIN
COMPREHENSIVE STUDY
COVERING RESERVOIR SITES
ON
EMBARRASS RIVER, ILLINOIS
AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA

APPENDIX A

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TABLE I

SUMMARY OF COSTS
LINCOLN MULTIPLE PURPOSE RESERVOIR PROJECT
(Based on unit prices prevailing in December 1963)

Item	Cost	Cost With Indirect Costs Distributed
Land and damages	$ 12,300,000	$ 12,300,000
Relocations	8,200,000	9,348,000
Reservoir	1,750,000	2,045,000
Dam and appurtenances	3,640,000	4,150,000
General recreation	(3,790,000)	(4,320,000)
Initial	1,790,000	2,040,000
Future increment	2,000,000	2,280,000
Fish and wildlife recreation	125,000	143,000
Buildings, grounds and utilities	100,000	114,000
Permanent operating equipment	70,000	80,000
Engineering and design	1,185,000	
Supervision and administration	1,300,000	
Total Project Cost 1/	$ 33,000,000	$ 33,000,000
Less Future Recreation Increment		2,280,000
Total Cost Initial Construction		$ 30,720,000

1/ Preauthorization cost of $35,000 not included.

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TABLE 2

DETAILED ESTIMATE OF FIRST COST
LINCOLN MULTIPLE PURPOSE RESERVOIR PROJECT
(Based on unit prices prevailing in December 1963)

Item	Unit	Quantity	Unit Price	Amount
LANDS AND DAMAGES				
FLOOD CONTROL				
Fee acquisition				
Homesites	Acre	250	$ 750.00	$ 187,500
Leasehold sites (Lake Charleston)	Each	25	1,000.00	25,000
Cropland (Fair)	Acre	8,500	250.00	2,125,000
Cropland (Good)	Acre	11,250	400.00	4,500,000
Pasture	Acre	3,000	60.00	180,000
Woodland, Wasteland, Riverbed & Bank	Acre	12,475	25.00	312,000
Subtotal, Fee Acquisition				$ 7,329,500
Improvements	Job	1		1,264,500
Severance damages	Job	1		1,295,500
Resettlement costs	Each	145	500.00	72,500
Contingencies				1,565,500
Acquisition costs	Job	1	900.00	472,500
TOTAL, FLOOD CONTROL				$12,000,000
LANDS AND DAMAGES				
RECREATION				
Fee Acquisition				
Cropland	Acre	1,000	250.00	$ 250,000
Pasture	Acre	600	60.00	36,000
Woodland	Acre	1,700	25.00	42,500
Subtotal, Fee Acquisition				$ 328,500

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TABLE 2
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
Improvements	Job	1	$ -	$ 220,000
Severance damages	Job	1	-	80,000
Resettlement costs		35	500.00	17,500
Contingencies				114,000
Acquisition costs				40,000
TOTAL, RECREATION				$ 800,000
TOTAL, LANDS AND DAMAGES				12,800,000

TABLE 2
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
RELOCATIONS					
ROADS					
State Roads					
SR-13[illegible]	Job	1		$ 475,000	0.53
SR-130	Job	1		[illegible],000	0.66
SR-133	Job	1		2[illegible],000	0.28
SR-13[illegible](4 lanes)	Job	1		760,000	0.45
Subtotal, State Roads				2,409,000	1.92
Federal Aid Secondary Roads					
F.A.S. 170	Job	1		$ 777,000	0.81
F.A.S. 3	Job	1		123,000	0.17
F.A.S. 7	Job	1		43,000	0.32
F.A.S. 170	Job	1		235,000	0.26
Subtotal, Federal Aid Secondary Roads				$1,186,000	1.56
County Roads					
Bushton Rd., (Main Stem)	Job	1		$ 266,000	1.02
Polecat Cr.Br.	Job	1		13,000	0.19
Whetstone Cr.Br.	Job	1		83,000	0.17
Barnett Bridge	Job	1		157,000	0.28
County road	Job	1		132,000	0.22
Subtotal, County Roads				$ 651,000	1.88
Removal of bridges	Job	1		120,000	
SUBTOTAL, ROADS				$4,366,000	5.36
RAILROADS					
N.Y.C. & St. Louis	Job	1		$1,865,000	3.03
SUBTOTAL, RAILROAD				$1,865,000	3.03
CEMETERIES					
Sec. 2, T11N,R9E	Graves	60	200.00	$ 12,000	
Sec. 20,T11N,R9E	Graves	150	200.00	30,000	
Sec. 14,T11N,R9E	Graves	5	200.00	1,000	
Sec. 22,T14N,R1DE	Graves	225	200.00	45,000	
SUBTOTAL, CEMETERIES				$ 88,000	

TABLE 2
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
UTILITIES					
Electric service lines	Job	1	L.S.	$ 90,000	6.02
Telephone lines	Job	1	L.S.	30,000	6.02
Misc. utility lines	Job	1	L.S.	50,000	
Alterations to Fox Ridge State Park	Job	1	L.S.	100,000	
Bank protection Oakland Water Supply Dam				30,000	
Relocation; Clarleston Water Works pump plant	Job	1	L.S.	70,000	
SUBTOTAL, UTILITIES				$ 370,000	
Subtotal				$6,689,000	
Contingencies				1,511,000	
TOTAL, RELOCATIONS				$8,200,000	
RESERVOIR					
Clearing wooded areas	Acre	4,100	350.00	$1,435,000	
Removal, structures	Job	1	L.S.	20,000	
Subtotal				$1,455,000	
Contingencies				335,000	
TOTAL, RESERVOIR				$1,790,000	

TABLE 2
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
DAM AND APPURTENANCES				
SPILLWAY				
Clearing and grubbing	Job	1	L.S.	$ 5,000
Excavation, common	C.Y.	60,400	.55	33,300
Fertilizer and seeding	Acre	6	500.00	3,000
Concrete cutoff sill	Job	1	L.S.	53,100
SUBTOTAL, SPILLWAY				$ 94,400
DAM				
Diversion	Job	1	L.S.	$ 50,000
Clearing and grubbing	Job	1	L.S.	13,000
Embankment, compacted impervious fill	C.Y.	1,137,000	0.10	113,700
Embankment, random fill (Includes borrow and placing)	C.Y.	260,000	0.60	156,000
Excavation, cut-off trench	C.Y.	46,300	0.60	27,780
Excavation, stripping	C.Y.	32,700	0.55	17,985
Borrow, impervious	C.Y.	1,253,000	0.45	563,900
Riprap	C.Y.	19,700	10.00	197,000
Bedding	C.Y.	9,800	4.00	39,200
Drain material	C.Y.	27,500	5.00	137,500
Guard rail	L.F.	4,840	2.50	12,100
Roadway surfacing on dam	S.Y.	4,840	4.00	19,360
Drilling and grouting	Job	1	L.S.	100,000
Trash boom	Job	1	L.S.	15,000
Fertilizer and seeding	Job	1	L.S.	3,500
Access road	Job	1	L.S.	25,000
SUBTOTAL, DAM				$1,491,025
OUTLET WORKS				
Clearing and grubbing	Job	1	L.S.	$ 1,000
Structural excavation, earth	C.Y.	51,800	1.50	77,700
Structural excavation, rock	C.Y.	10,800	5.00	54,000
Channel excavation, earth	C.Y.	43,000	0.75	32,300
Backfill, compacted	C.Y.	5,200	4.00	20,800

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TABLE 2
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
OUTLET WORKS (Cont'd)				
Monolithic conc. conduit	L.F.	500	290.00	$ 145,000
Operating tower, superstructure	Job	1	L.S.	256,000
Operating tower, mechanical	Job	1	L.S.	450,000
Concrete; basin, walls	C.Y.	3,480	60.00	208,800
Reinforcing steel	Lbs.	80,000	0.15	12,000
Electrical work	Job	1	L.S.	18,000
Service bridge	Job	1	L.S.	52,500
SUBTOTAL, OUTLET WORKS				$1,328,100
Subtotal				2,913,525
Contingencies				726,475
TOTAL, DAM AND APPURTENANCES				$3,640,000
GENERAL RECREATION				
Initial	Job	1		1,790,000
Future increment	Job	1		2,000,000
TOTAL GENERAL RECREATION				3,790,000 1/
FISH AND WILDLIFE RECREATION				
Multiple stage, low flow outlets with re-oxygenating facilities	Job	1		$ 95,000
Park trails	Job	1		1,000
Access facilities	Job	1		4,000
Subtotal				$ 100,000
Contingencies				25,000
TOTAL, FISH AND WILDLIFE RECREATION				$ 125,000
BUILDINGS, GROUNDS AND UTILITIES				
Shop building	Job	1		$ 15,000
Site development, utilities for shop building	Job	1		3,000
Operators quarters	Each	2	20,000	40,000

1/ Includes contingencies

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TABLE 2
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
BUILDINGS, GROUNDS AND UTILITIES (Cont'd)				
Site development and exterior utilities for quarters	Job	1		$ 8,000
Miscellaneous, utilities	Job	1		15,000
Subtotal				$ 81,000
Contingencies				19,000
TOTAL, BUILDINGS, GROUNDS AND UTILITIES				$ 100,000
PERMANENT OPERATING EQUIPMENT				
Tractor, truck, mower, tools, etc.	Lot	1		$ 10,000
Radio facilities	Job	1		20,000
Rainfall and discharge stations	Job	1		30,000
Subtotal				$ 60,000
Contingencies				10,000
TOTAL, PERMANENT OPERATING EQUIPMENT				$ 70,000

TABLE 3

DETAILED ESTIMATE OF ANNUAL COSTS
LINCOLN MULTIPLE PURPOSE RESERVOIR PROJECT

Item	Financial	Economic
INITIAL PROJECT		
a. Total investment		
(1) Recapitulation of project costs		
(a) Total net costs	$30,720,000	$30,720,000
(b) Market value of lands	-	9,900,000
(2) Interest during construction		
3% for 1/2 construction period 4 years (6%)	1,843,000	1,843,000
(3) Total gross investment	$32,563,000	$32,563,000
(4) Net salvage value	-	-
(5) Total Federal net investment	$32,563,000	$32,563,000
b. Annual Costs		
(1) Interest on gross investment		
(a) Financial: (3%)(32,563,000)	977,000	
(b) Economic: (3%)(32,563,000)		977,000
(c) Economic: Adjustment for net loss of land		
(5%-3%)(9,900,000)	-	198,000
(2) Amortization		
(a) Financial: (0.00165)(32,563,000)	54,000	
(b) Economic: (0.00165) (32,563,000)		54,000

TABLE 3
(Cont'd)

Item	Financial	Economic
(3) Maintenance and operation		
(a) Dam and reservoir	$ 40,000	$ 40,000
(b) General recreation	104,000	104,000
(c) Fish and Wildlife	0	0
(4) Major replacements		
(a) Dam and reservoir	3,000	3,000
(b) General recreation	18,000	18,000
(5) Total initial annual charges -	$ 1,196,000	$ 1,394,000
c. Future Recreation Increment		
(1) Interest on gross investment		
(a) Financial: (3%) (2,280,000)	68,000	-
(b) Economic: (3%) (2,280,000)	-	68,000

TABLE 3
(Cont'd)

Item	Financial	Economic
(2) Amortization		
(a) Financial: (0.00165)(2,280,000)	3,800	
(b) Economic: (0.00165)(2,280,000)		3,800
(3) Maintenance and operation		
(a) Dam and reservoir	-	-
(b) General recreation	140,000	140,000
(4) Major replacements		
(a) Dam and reservoir	-	-
(b) General recreation	19,000	19,000
Subtotal	$ 230,800	$ 230,800
Present worth - 100 yr. accelerated growth @ 3% (.65047)	$ 150,000	$ 150,000
ARA economic cost reduction		91,000
Total annual charges	$ 1,346,000	$ 1,453,000

TABLE 4

SUMMARY OF COSTS
CLIFTY CREEK MULTIPLE PURPOSE RESERVOIR PROJECT
(Based on unit prices prevailing in December 1963)

Item	Cost	Cost with Indirect Costs Distributed
Lands and damages	$ 1,810,000	$ 1,810,000
Relocations	2,250,000	2,600,000
Reservoir	140,000	161,000
Dam and appurtenances	6,360,000	7,357,000
Levees	290,000	334,000
General recreation	(2,870,000)	(3,310,000)
Initial	1,100,000	1,270,000
Future increment	1,770,000	2,040,000
Fish and wildlife recreation	110,000	127,000
Building, ground and utilities	100,000	115,000
Permanent operating equipment	75,000	86,000
Engineering and design	912,000	-
Supervision and administration	963,000	-
Total cost of project 1/	$15,900,000	$15,900,000
Less recreation, future increment		2,040,000
Total cost initial construction 1/		$13,860,000

1/ Preauthorization cost of $35,000 not included.

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TABLE 5

DETAILED ESTIMATE OF FIRST COSTS
CLIFTY CREEK MULTIPLE PURPOSE RESERVOIR PROJECT

Item	Unit	Quantity	Unit Price	Amount
LANDS AND DAMAGES				
FLOOD CONTROL				
Fee acquisition				
Homesites	Each	60	$ 700	$ 42,000
Lots	Each	12	500	6,000
Lots	Each	18	300	5,400
Cropland	Acre	1,536	325	499,200
Pasture	Acre	548	90	49,320
Woodland	Acre	924	70	64,680
Waste	Acre	272	25	6,800
Subtotal, Fee acquisition				$ 673,400
Improvements				
Sets of buildings		25	5,385	$ 134,625
Dwellings		13	4,375	56,875
Town of Hartsville	Job	1	-	69,000
Subtotal				260,500
Isolation				
6 Tracts including land & improvements				194,000
Valuation of Mineral Rights				-0-
Severance damage				140,085
Contingencies				190,015
Resettlement Costs				
60 family units			$ 500	30,000
Relocation Costs				
Cemetery-NW section of Hartsville, rights-of-way costs & borrow areas				7,000

TABLE 5
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
Hartsville College Cemetery additional cost of land & improvements				$ 30,000
Acquisition Costs				
110 Tracts			$ 900	99,000
TOTAL, FLOOD CONTROL				$1,624,000
LANDS AND DAMAGES				
GENERAL RECREATION				
Fee acquisition				
Cropland	Acre	306	325	$ 99,450
Pasture	Acre	108	90	9,720
Woodland	Acre	186	70	13,020
Subtotal, Fee Acquisition				$ 122,190
Improvements	Job	1		16,050
Severance damages	Job	1		20,736
Resettlement costs	Job	1		1,500
Contingencies				22,824
Acquisition costs	Job	1		2,700
TOTAL, GENERAL RECREATION				$ 186,000
TOTAL, LANDS AND DAMAGES				$1,810,000

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
RELOCATIONS					
ROADS					
State roads					
SR-46	Job	1		$ 732,400	3.28

TABLE 5
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
RELOCATIONS (Cont'd)					
ROADS					
SR-635	Job	1		$ 165,600	0.25
SR-637	Job	1		332,000	0.77
Subtotal, State Roads				$1,280,000	
County roads					
Bartholomew - Decatur	Job	1		284,000	0.85
Bridge removal	Job	1		52,000	
SUBTOTAL, ROADS				$1,616,000	5.15
CEMETERIES					
Hartsville College Cemetery	Graves	525	$200.00	$ 105,000	
Cemetery; NW Section of Hartsville	Graves	198	200.00	39,600	
SUBTOTAL, CEMETERIES				$ 144,600	
UTILITIES					
Electric Lines	Job	1		18,000	11.0
Telephone Lines	Job	1		12,000	11.0
SUBTOTAL, UTILITIES				$ 30,000	
Subtotal				$1,790,600	
Contingencies				459,400	
TOTAL, RELOCATIONS				$2,250,000	
RESERVOIR					
Clearing wooded areas	Acre	180	$350.00	$ 63,000	
Light clearing & brush, fence rows, etc.	Acre	390	80.00	31,200	

TABLE 5
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
RESERVOIR (Cont'd)					
Remove structures	Job	1	-	$ 15,000	
Contingencies				30,800	
TOTAL, RESERVOIR				$ 140,000	
DAM AND APPURTENANCES					
EARTH SECTION AND DIKE					
Clearing and grubbing	Job	1	L.S.	$ 10,000	
Diversion and care of river	Job	1	L.S.	10,000	
Stripping for embankment	C.Y.	45,000	0.55	24,750	
Excavation, trench, earth	C.Y.	37,000	0.60	22,200	
Excavation, borrow, impervious	C.Y.	730,000	0.45	328,500	
Compacted fill	C.Y.	690,000	0.10	69,000	
Drain material	C.Y.	45,000	5.00	225,000	
Riprap, dumped	C.Y.	22,000	10.00	220,000	
Bedding	C.Y.	11,000	6.00	66,000	
Seeding	Acre	13	500.00	6,500	
Drilling and grouting dam	Job	1	L.S.	300,000	
Roadway surfacing	S.Y.	17,000	4.00	68,000	
Guard rail	L.F.	21,000	2.50	52,500	
Piezometers	Job	1	L.S.	6,000	
Power and gas to dam site	Job	1	L.S.	6,000	
Trash boom	Job	1	L.S.	30,000	
SUBTOTAL, EARTH SECTION AND DIKE				$1,444,450	
CONCRETE SECTION					
Clearing work area	Job	1		3,000	
Excavation, common	C.Y.	58,000	0.55	31,900	
Excavation, rock	C.Y.	20,000	1.75	35,000	
Excavation, structural, rock	C.Y.	2,300	10.00	23,000	

TABLE 5
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
CONCRETE SECTION (Cont'd)					
Backfill, compacted	C.Y.	10,000	2.50	$ 25,000	
Concrete, bridge deck and parapet	C.Y.	60	80.00	4,800	
Concrete, sills and baffles	C.Y.	400	60.00	24,000	
Concrete, walls and piers	C.Y.	8,500	50.00	425,000	
Concrete, apron slab and keys	C.Y.	2,700	40.00	108,000	
Concrete, mass	C.Y.	79,200	26.00	2,059,200	
Re-inforcing steel	lb.	720,000	0.14	100,800	
Crest gates, complete	Ea.	3	110,000.00	330,000	
Derrick stone, in place	C.Y.	1,500	15.00	22,500	
Spalls, in place	C.Y.	300	7.00	2,100	
Gravel in drains	C.Y.	600	7.00	4,200	
Structural steel	lb.	40,000	0.25	10,000	
Miscellaneous steel and iron	lb.	20,000	0.50	10,000	
Miscellaneous nonferrous metal	lb.	12,000	2.50	30,000	
Water stops	lb.	4,000	2.00	8,000	
Miscellaneous pipe and fittings	lb.	16,000	0.75	12,000	
Drilling and placing anchors	L.F.	1,400	5.00	7,000	
Drilling drainage holes	L.F.	3,000	6.00	18,000	
Bridge railing	L.F.	1,200	7.00	8,400	
Handrail, pipe	L.F.	220	5.00	1,100	
Foundation protective treatment	S.Y.	7,000	2.00	14,000	
Electric system	Job	1	L.S.	100,000	
Staff gages	Job	1	L.S.	5,000	
Pylon and operating building	Job	1	L.S.	50,000	
Sluice gates, complete	Ea.	2	$60,000.00	120,000	
Emergency bulkheads and guides	lb.	14,000	0.50	7,000	
Misc. pipe and fittings sluices	lb.	12,000	0.75	9,000	
Drilling and grouting				50,000	
SUBTOTAL, CONCRETE SECTION				$3,658,000	

TABLE 5
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
DAM AND APPURTENANCES (Cont'd)				
CONCRETE SECTION (Cont'd)				
Subtotal				$5,102,450
Contingencies				1,277,550
TOTAL DAM AND APPURTENANCES				$6,380,000
HARTSVILLE LEVEE				
Clearing and grubbing	Job	1		$ 1,000
Stripping and exploration	C.Y.	22,000	0.55	12,100
Embankment	C.Y.	153,000	0.10	15,300
Excavation, borrow	C.Y.	176,000	0.45	79,200
Riprap, dumped	C.Y.	8,200	10.00	82,000
Bedding	C.Y.	4,100	6.00	24,600
Seeding	Acre	9	500.00	4,500
Interior drainage structures	Job	1		13,500
Subtotal, Hartsville Levee				$ 232,200
Contingencies				57,800
TOTAL, HARTSVILLE LEVEE				$ 290,000
GENERAL RECREATION				
Initial	Job	1	L.S.	$1,100,000
Future increment	Job	1	L.S.	1,770,000
TOTAL, GENERAL RECREATION				$2,870,000 1/
FISH AND WILDLIFE RECREATION				
Multiple-stage low flow outlets with re-oxygenating facilities	Job	1		$ 85,000
Subtota				85,000
Contingencies				25,000
TOTAL, FISH AND WILDLIFE RECREATION				$ 110,000

1/ Includes contingencies

TABLE 5
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
BUILDINGS, GROUNDS AND UTILITIES				
Shop building	Job	1		$ 20,000
Water and sanitary system	Job	1		30,000
Electric service	Job	1		5,000
Site grading and landscaping	Job	1		5,000
Roads and surfacing	Job	1		5,000
Parking areas	Job	1		15,000
Subtotal				$ 80,000
Contingencies				20,000
TOTAL, BUILDINGS, GROUNDS AND UTILITIES				$ 100,000
PERMANENT OPERATING EQUIPMENT				
Tractor, truck, mower tools, etc.	Lot	1		$ 10,000
Radio facilities	Job	1		20,000
Rainfall and discharge stations	Job	1		30,000
Subtotal				$ 60,000
Contingencies				15,000
TOTAL, PERMANENT OPERATING EQUIPMENT				$ 75,000

TABLE 6

DETAILED ESTIMATE OF ANNUAL COSTS
CLIFTY CREEK MULTIPLE PURPOSE RESERVOIR PROJECT

Item	Financial	Economic
a. Total investment - Initial Project		
(1) Recapitulation of project costs		
(a) Total net costs	$ 13,860,000	$ 13,860,000
(b) Market value of lands		935,000
(2) Interest during construction		
3.0% for 1/2 construction period		
4 years (6.0%)	832,000	832,000
(3) Total gross investment	14,692,000	14,692,000
(4) Net salvage value	-	-
(5) Total Federal net investment	14,692,000	14,692,000
b. Annual costs		
Initial Project:		
(1) Interest on gross investment		
(a) Financial: (3.0%)(14,692,000)	441,000	
(b) Economic: (3.0%)(14,692,000)	-	441,000
(c) Economic: Adjustment for net loss of land (5%-3.0%) (935,000)	-	19,000
(2) Amortization		
(a) Financial: (0.00165)(14,692,000)	24,200	
(b) Economic: (0.00165)(14,692,000)		24,200
(3) Maintenance and operation		
(a) Dam and reservoir	35,000	35,000
(b) General recreation	58,000	58,000

TABLE 6
(Cont'd)

Item	Financial	Economic
(4) Major replacement		
(a) Dam and reservoir	$ 7,000	$ 7,000
(b) General recreation	10,800	10,800
(5) Total initial annual charges	$ 576,000	$ 595,000
Future Recreation Increment:		
(6) Interest on gross investment (3.0%) (2,040,000)	$ 61,000	$ 61,000
(7) Amortization (0.00165) (2,040,000)	3,000	3,000
(8) Maintenance and operation General recreation	121,000	121,000
(9) Major replacements General recreation	17,000	17,000
Subtotal	$ 202,000	$ 202,000
Present worth - 100-year accelerated growth at 3% (.65047)	$ 131,000	$ 131,000
Total Annual Charges	$ 707,000	$ 726,000

TABLE 7

SUMMARY OF COSTS
PATOKA MULTIPLE PURPOSE RESERVOIR PROJECT
(Based on unit prices prevailing in December 1963)

Item	Cost	Cost with Indirect Cost Distributed
Lands and Damages	$ 3,060,000	$ 3,060,000
Relocations	5,150,000	5,923,000
Reservoir	800,000	919,000
Dam and Appurtenances	7,170,000	8,241,000
General Recreation	(4,730,000)	(5,435,000)
Initial	1,630,000	1,875,000
Future Increment	3,100,000	3,560,000
Fish and Wildlife	200,000	228,000
Bldg., Ground and Utilities	100,000	114,000
Permanent Operating Equipment	70,000	80,000
Engineering and Design	1,285,000	
Supervision and Administration	1,435,000	
Total Project Cost	$24,000,000	$24,000,000
Less Recreation Future Increment		3,560,000
Total Cost Initial Construction		$20,440,000

TABLE 8

DETAILED ESTIMATE OF FIRST COST
PATOKA MULTIPLE PURPOSE RESERVOIR PROJECT

Item	Unit	Quantity	Unit Price	Amount
LANDS AND DAMAGES				
FLOOD CONTROL & CONSERVATION				
Fee acquisition				
Land				
Homesites	Acre	190	$ 350.00	$ 66,500
Crop land	Acre	4,940	110.00	543,400
Pasture	Acre	6,270	35.00	219,450
Wood land - Waste	Acre	7,600	15.00	114,000
Subtotal				$ 943,350
Improvements				
Sets of buildings	Each	126	$2,700.00	$ 340,200
Dwellings	Each	13	4,150.00	53,950
St. Joe G.B. Church				5,000
Elon Christian Church				7,000
Newton Stewart Church				4,000
Subtotal				$ 410,150
Isolation				
Tracts	Each	40	$8,500.00	$ 340,000
Valuation of mineral rights				0
Severance damage				340,000
Resettlement costs	Each	160	$ 500.00	80,000
Contingencies				336,500
Acquisition costs	Job	1		400,000
TOTAL, FLOOD CONTROL				2,850,000

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
Federal Aid Secondary Roads					
S-732 Patoka Riv.	Job	1		$ 133,000	0.23
S-566 S.W. of dam	Job	1		75,300	1.04
S-732 Alstott Cr.	Job	1		45,600	0.15
S-1191 at Elon	Job	1		1,016,000	1.40
Subtotal, Fed. Aid Sec. roads				$1,269,900	2.82
County roads					
Misc. Co. roads	Job	1		$ 800,000	4.94
Removal of bridges	Job	1		165,000	
SUBTOTAL, ROADS				$3,943,400	13.62
CEMETERIES					
Cemeteries (5)	Graves	410	$200.00	$ 82,000	
SUBTOTAL, CEMETERIES				$ 82,000	
RIGHTS OF WAYS					
Borrow areas	Job	1		$ 30,000	
SUBTOTAL, RIGHTS OF WAYS				$ 30,000	
UTILITIES					
Telephone lines	Job	1		$ 13,600	13.62
Electric ser.line	Job	1		21,400	13.62
Power line	Job	1		28,000	2.00
SUBTOTAL, UTILITIES				$ 63,000	29.24
Subtotal				$4,118,400	
Contingencies				1,031,600	
TOTAL, RELOCATIONS				$5,150,000	

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
LANDS AND DAMAGES				
GENERAL RECREATION				
Fee acquisition				
Cropland	Acre	500	$110.00	$ 55,000
Pasture	Acre	970	35.00	30,450
Wood land	Acre	1,450	15.00	21,750
Subtotal				$ 106,000
Improvements	Job	1		20,000
Severance damages				20,000
Resettlement costs				5,000
Contingencies				25,000
Acquisition costs				20,000
TOTAL, GENERAL RECREATION				$ 210,000
TOTAL, LANDS AND DAMAGES				3,060,000

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
RELOCATIONS					
ROADS					
State roads					
S.R. 145 Painter Cr.	Job	1		$ 233,500	0.43
S.R. 145 Fleming Cr.	Job	1		893,000	3.15
S.R. 164 Lick Fk. Cr.	Job	1		513,500	2.08
S.R. 164 Int. w/145	Job	1		60,400	0.20
Subtotal, State roads				$1,700,500	5.86

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount	Length (Miles)
Federal Aid Secondary Roads					
S-732 Patoka Riv.	Job	1		$ 133,000	0.23
S-566 S.W. of dam	Job	1		75,300	1.04
S-732 Alstott Cr.	Job	1		45,600	0.15
S-1191 at Elon	Job	1		1,016,000	1.40
Subtotal, Fed. Aid Sec. roads				$1,269,900	2.82
County roads					
Misc. Co. roads	Job	1		$ 800,000	4.94
Removal of bridges	Job	1		165,000	
SUBTOTAL, ROADS				$3,943,400	13.62
CEMETERIES					
Cemeteries (5)	Graves	410	$200.00	$ 82,000	
SUBTOTAL, CEMETERIES				$ 82,000	
RIGHTS OF WAYS					
Borrow areas	Job	1		$ 30,000	
SUBTOTAL, RIGHTS OF WAYS				$ 30,000	
UTILITIES					
Telephone lines	Job	1		$ 13,600	13.62
Electric ser.line	Job	1		21,400	13.62
Power line	Job	1		28,000	2.00
SUBTOTAL, UTILITIES				$ 63,000	29.24
Subtotal				$4,118,400	
Contingencies				1,031,600	
TOTAL, RELOCATIONS				$5,150,000	

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
RESERVOIR				
Clearing wooded areas	Acre	1,470	$ 350.00	$ 514,500
Brush, fence rows, etc.	Acre	6,660	15.00	100,000
Removal, structures	Job	1		30,000
Subtotal				$ 644,500
Contingencies				155,500
TOTAL, RESERVOIR				$ 800,000
DAM AND APPURTENANCES				
SPILLWAY				
Clearing and grubbing	Job	1		$ 1,000
Excavation, common	c.y.	417,800	0.55	229,790
Excavation, rock	c.y.	436,000	1.25	545,000
Guard fence	L.F.	2,600	4.00	10,400
Concrete control sill	Job	1		132,000
Seeding	Acre	20	500.00	10,000
Service road	Job	1		10,000
SUBTOTAL, SPILLWAY				$ 938,190
DAM				
Stream diversion	Job	1		$ 25,000
Clearing and grubbing	Job	1		5,000
Excavation, borrow	c.y.	348,000	0.45	156,600
Excavation, stripping	c.y.	100,000	0.55	55,000
Excavation, trenching	c.y.	10,300	0.45	4,635
Drilling and grouting	Job	1		2,000,000
Fill, random rock	c.y.	523,000	0.20	104,640
Fill, impervious	c.y.	288,300	0.15	43,245
Graded drain	c.y.	18,745	5.00	93,725
Graded aggregate	c.y.	18,745	5.00	93,725
Special grouting to hold pool	Job	1		500,000
Riprap, dumped	c.y.	18,800	10.00	188,000
Bedding	c.y.	9,200	6.00	55,200
Guard rail	L.F.	4,680	2.50	11,700
Roadway surfacing	s.y.	5,555	4.00	22,220
Fertilizer and seeding	Acre	8	500.00	4,000
Access road	Job	1		75,000
Relief wells	Job	1		50,000

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
Trash boom	Job	1		$ 15,000
SUBTOTAL, DAM				$3,502,690
DIKE				
Excavation, stripping	c.y.	12,000	0.45	5,400
Excavation, trenching	c.y.	2,400	0.45	1,080
Excavation, borrow	c.y.	161,000	0.45	69,075
Fill, impervious	c.y.	133,500	0.15	20,025
Guard rail	L.F.	3,120	2.50	7,800
Fertilizer & seeding	Acre	2.3	500.00	1,150
Riprap, dumped	c.y.	6,200	10.00	62,000
Bedding	c.y.	3,100	6.00	18,600
Roadway surfacing	s.y.	1,560	4.00	6,200
SUBTOTAL, DIKE				$ 191,330
OUTLET WORKS				
Clearing and grubbing	Job	1		$ 2,000
Excavation, structural, earth	c.y.	20,400	1.50	30,600
Excavation, channel, earth	c.y.	106,000	0.75	79,500
Excavation, rock, structural	c.y.	950	6.00	5,700
Backfill, compacted	c.y.	2,800	4.00	11,200
Riprap, dumped	c.y.	200	10.00	2,000
Bedding	c.y.	100	6.00	600
Concrete, basin, walls, etc.	c.y.	2,100	60.00	126,000
Reinforcing steel	lb.	150,000	0.15	22,500
Monolithic conc. conduit	L.F.	430	260.00	111,800
Operating tower, structure	Job	1		250,000
Operating tower, mechanical	Job	1		400,000
Electrical work	Job	1		20,000
Service bridge	Job	1		50,000
SUBTOTAL, OUTLET WORKS				$1,111,900

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
Subtotal				$5,744,110
Contingencies				1,425,890
TOTAL, DAM AND APPURTENANCES				$7,170,000
GENERAL RECREATION				
Initial	Job	1	L.S.	$1,630,000
Future increment	Job	1		3,100,000
TOTAL, GENERAL RECREATION				$4,730,000 1/
FISH AND WILDLIFE RECREATION				
Multiple stage, low flow outlets with reoxygenating facilities	Job	1		$ 120,000
Access facilities	Job	1		30,000
Park trails	Job	1		3,000
Signs and markers	Job	1		2,000
Water supply	Job	1		10,000
Subtotal				$ 165,000
Contingencies				35,000
TOTAL, FISH AND WILDLIFE RECREATION				$ 200,000
BUILDINGS, GROUNDS AND UTILITIES				
Shop building	Job	1		$ 10,000
Water and sanitary system	Job	1		15,000
Site grading and landscaping	Job	1		5,000
Utilities for shop and operators quarters	Job	1		5,000
Operators quarters	Job	1		40,000
Subtotal				$ 75,000
Contingencies				25,000
TOTAL BUILDINGS, GROUNDS AND UTILITIES				$ 100,000

1/ Includes contingencies

TABLE 8
(Cont'd)

Item	Unit	Quantity	Unit Price	Amount
PERMANENT OPERATING EQUIPMENT				
Tractor, truck, mower, etc.	Lot	1		$ 10,000
Radio facilities	Job	1		20,000
Rainfall discharge stations	Job	1		30,000
Subtotal				$ 60,000
Contingencies				10,000
TOTAL, PERMANENT OPERATING EQUIPMENT				$ 70,000

TABLE 9

DETAILED ESTIMATE OF ANNUAL COSTS
PATOKA MULTIPLE PURPOSE RESERVOIR PROJECT

Item	Financial	Economic
a. Total investment - Initial Project		
(1) Recapitulation of project costs		
(a) Total net costs	$20,440,000	$20,440,000
(b) Market value of lands		1,400,000
(2) Interest during construction		
3% for 1/2 construction period 4 years (6%)	1,226,000	1,226,000
(3) Total gross investment		
(4) Net salvage value	-	-
(5) Total Federal net investment	21,666,000	21,666,000
b. Annual costs		
Initial Project:		
(1) Interest on gross investment		
(a) Financial: (3%)($21,666,000)	650,000	
(b) Economic: (3%)($21,666,000)		650,000
(c) Economic: Adjustment for net loss of land (5%-3%)($1,400,000)	-	28,000
(2) Amortization		
(a) Financial: (0.00165)($21,666,000)	36,000	
(b) Economic: (0.00165)($21,666,000)		36,000
(3) Maintenance and operation		
(a) Dam and reservoir	35,000	35,000
(b) Water Supply and water quality control	10,000	10,000

TABLE 9
(Cont'd)

Item	Financial	Economic
(c) General recreation	$ 96,000	$ 96,000
(4) Major replacements		
(a) Dam and reservoir	3,000	3,000
(b) General recreation	16,000	16,000
(5) Total initial annual charges	$ 846,000	$ 874,000
c. Annual costs		
Future Recreation Increment		
(1) Interest on gross investment		
(a) Financial: (3%)($3,560,000)	$ 107,000	
(b) Economic: (3%)($3,560,000)		$ 107,000
(2) Amortization		
(a) Financial: (0.00165)($3,560,000)	5,900	
(b) Economic: (0.00165)($3,560,000)		5,900
(3) Maintenance and operation		
(a) Dam and reservoir	-	-
(b) General recreation	201,000	201,000
(4) Major replacements		
(a) Dam and reservoir	-	-
(b) General recreation	30,000	30,000
Subtotal	$ 343,900	$ 343,900
Present worth - 100 year - accelerated growth at 3% (.65047)	224,000	224,000
A.R.A. Economic Cost Reduction		85,000
Total Annual Charges	$1,070,000	$1,013,000

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SECTION II - AREA REDEVELOPMENT ACT EFFECTS

a. ARA effects as a reduction in economic costs. The value of wages paid for construction, operation and maintenance of the proposed projects, to persons who would otherwise be unemployed and who live in redevelopment counties within communting distance of the projects is claimed as a reduction of economic costs. The values computed for the initial phase of construction of the projects were converted to average annual equivalent values by compound interest methods. All ARA wage expenditures for construction, operation and maintenance of the future increment of recreation and for operation and maintenance of the initial increment were discounted, with the assumption that employment opportunities would increase, without the projects, to full employment 20 years after completion of initial construction. These discounted values were then converted to average annual equivalent values by compound interest methods. The value of labor costs and skill requirements is based upon office studies of recent detailed cost estimates of Monroe and Barren Reservoirs. A summary of labor costs and skill requirements is presented in table 10.

TABLE 10

LABOR COSTS AND SKILL REQUIREMENTS FOR CONSTRUCTION OF BARREN AND MONROE RESERVOIRS

Item	Percent labor of 1st cost	Percent skill requirement		
		Skilled	Semiskilled	Unskilled
Lands & damages	0	-	-	-
Relocations	20	72	12	16
Reservoir & pool preparation	43	12	4	84
Dam & appurtenances	20	56	17	27
General recreation facilities	20	50	25	25
Buildings, ground & utilities	20	56	17	27
Permanent operating equipment	0	-	-	-

Further studies were made to ascertain the ability of the ARA reservoir counties to furnish the necessary skills from the unemployed rolls. Definitive studies are lacking in respect to accurate reporting of the inventory of skills among the unemployed at the county level. For this reason an estimate was prepared, based upon the available published employment data, and discussions with the field coordinators of the Area Redevelopment Program. Pertinent data are summarized in table 11.

TABLE 11

POPULATION, EMPLOYMENT AND UNEMPLOYED RATES IN ARA RESERVOIR COUNTIES

Project	ARA reservoir counties	ARA Classification	Population 1/	Employment 2/	Construction employment 2/	Percent 2/ unemployed
Lincoln	Coles	5b	42,860	16,908	767	6 +
	Cumberland	5b	9,936	3,551	146	6 +
Clifty Creek	-	-	-	-	-	-
Patoka	Crawford	5b	8,379	2,600	163	6 +
	Orange	5b	16,877	6,318	365	5.7

1/ 1960 census of population

2/ Employment and unemployment estimate, September 1963

The number and type of jobs created by construction of the proposed projects are summarized along with the estimate of utilization of skill requirements from the unemployed pool of the ARA counties in table 12 below.

TABLE 12

SKILL REQUIREMENTS FOR CONSTRUCTION AND UTILIZATION OF UNEMPLOYED WORKERS FROM ARA COUNTIES

	Job opportunities			Percent filled by ARA counties		
	Skilled	Semi-Skilled	Un-Skilled	Skilled	Semi-Skilled	Un-Skilled
Lincoln	78	23	77	25	50	100
Patoka	77	26	67	25	50	100

It is believed that the utilization of unemployed from ARA counties in construction of the proposed projects is conservatively stated.

Further reduction of unemployment is assumed by operation and maintenance of the proposed projects. For purposes of computation it is assumed that 70 percent of operation and maintenance expenditures are labor cost, that 40 percent of the labor required is skilled, 30 percent semiskilled and 30 percent unskilled. Furthermore it is assumed that skill requirements filled from the unemployed residing in redevelopment counties would be 25 percent of the skilled labor requirement, 50 percent of the semiskilled labor requirement and 100 percent of the unskilled labor requirement.

Computations of the annual values of the reduction of economic costs by ARA effects are presented in tables 13 and 14. The ARA factor is computed by multiplying the expenditure for labor in each skill requirement by the percent utilized from the unemployed rolls of ARA counties.

TABLE 13

ARA EFFECTS TO CONSTRUCTION - LINCOLN RESERVOIR

Item	Total Cost ($1,000)	Labor Cost	ARA Factor	ARA Cost Offset ($1,000)
Lands & damages	12,800	-	-	-
Relocations	9,348	1,869	.40	748
Reservoir & pool preparation	2,045	879	.89	782
Dam & appurtenances	4,150	830	.495	411
General Recreation facilities (initial)	2,040	408	.50	204
Fish & Wildlife facilities	143	29	.50	15
Buildings, grounds & utilities	114	23	.495	11
Permanent operating equipment	80	-	-	-
Subtotal, initial	30,720	4,038	.5377	2,171
General recreation facilities (future increment)	2,280	456	.50	(228)
Present value of future increment 1/				52
Total & future increment	33,000	4,494		2,223
Average annual equivalent at this reduction of economic costs				70

1/ Present value factor assumes accelerated growth curve with ARA participation declining to 0 after year 20 (factor = 3.054 x .06722 = 0.2289)

TABLE 14

ARA EFFECTS TO CONSTRUCTION - PATOKA RESERVOIR

Item	Total Cost ($1,000)	Labor Cost	ARA Factor	ARA Cost Offset ($1,000)
Lands & damages	3,060	-	-	-
Relocations	5,923	1,185	.40	474
Reservoir & pool preparation	919	395	.89	352
Dam & appurtenances	8,241	1,648	.495	816
General recreation facilities (initial)	1,875	375	.50	188
Fish & Wildlife facilities	228	46	.50	23
Buildings, ground & utilities	114	23	.495	11
Permanent operating equipment	80	-	-	-
Subtotal initial	20,440	3,672	.5076	1,864
General recreation facilities (future increment)	3,560	712	.50	(356)
Present value of future increment[1/]				81
Total initial	24,000	4,384		1,945
Average annual equivalent of this reduction of economic costs (1,945 x 0.03165)				62

1/ Present value discount assumes accelerated growth curve with ARA participation declining to 0 after year 20 (Factor = 3.054 x .06722 = 0.2289)

The computations of ARA effects for operation and maintenance of the proposed projects is represented in table 15 below.

TABLE 15

ARA EFFECTS TO OPERATION AND MAINTENANCE EXPENDITURES ($1,000)

Reservoir	Annual Expenditure	Labor Cost	ARA Wage Expenditure 1/	AAE of ARA Wage Exp.
Lincoln				
Initial	144	101	56	15 2/
Increment	140	98	54	6 3/
Total	284	199	110	21
Patoka				
Initital	141	98	54	15 2/
Increment	201	142	78	8 3/
Total	342	240	132	23

1/ Area Redevelopment Act Labor Cost Factor -0.55

2/ Accumulated present worth factor for 20 year period declining from 100% to 0 at end of period (8.53X0.03165)

3/ Accumulated present worth factor for 20 year period of an accelerated growth curve with decline from 100% to 0 at end of period (3.054X0.03165)

A summary of Area Redevelopment Act effects used as a reduction of annual economic charges is presented in table 16.

TABLE 16

SUMMARY OF ARA EFFECTS AS REDUCTION OF ANNUAL ECONOMIC COSTS

Reservoir	ARA Wage Expenditure (1,000) Construction	Operation and Maintenance	Total
Lincoln	70 1/	21 3/	91
Patoka	62 2/	23 3/	85

1/ Table 13

2/ Table 14

3/ Table 15

b. ARA effects as a reduction in allocated construction costs. The value of wages paid for construction of the proposed projects were included in the allocation of construction costs to each project purpose as a reduction of the allocated construction costs, with the assumption that cost of reducing unemployment is a Federal responsibility. A summary of the ARA effects to construction used to offset allocated construction costs is presented below.

Reservoir	First Cost ($1,000)	Labor Cost ($1,000)	ARA Construction Cost Offset Specific Facilities ($1,000)	Joint Use Facilities ($1,000)	Total ($1,000)
Lincoln	33,000	4,494	271	1,952	2,223
Clifty Creek	15,900	2,641	-	-	-
Patoka	24,000	4,384	293	1,652	1,945

INTERIM REPORT NO. 2
WABASH RIVER BASIN
COMPREHENSIVE STUDY
COVERING RESERVOIR SITES
ON
EMBARRASS RIVER, ILLINOIS
AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA

APPENDIX B

ECONOMIC DEVELOPMENT AND ESTIMATES OF DAMAGES AND BENEFITS

JANUARY 1964

INTERIM REPORT NO. 2
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COMPREHENSIVE STUDY
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AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA

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ECONOMIC DEVELOPMENT AND
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APPENDIX B

ECONOMIC DEVELOPMENT AND
ESTIMATES OF DAMAGES AND BENEFITS

SECTION I - ECONOMIC DEVELOPMENT

1. ECONOMIC HISTORY OF THE WABASH RIVER BASIN

Population growth with its attendant development of economic activities in the Wabash River basin began early in the Nineteenth Century. Emigration of persons from the eastern part of the United States was facilitated by a natural route of travel, the Ohio River. Economic historians report that initially new communities were located along the main stem of the Ohio River, with a subsequent movement and settlement along the Wabash and other tributaries.

While natural waterways provided the major influence and impetus for early growth in the Wabash Basin, there were other factors which contributed to that development in the Nineteenth Century. The National Turnpike, which followed generally the line of Latitude 40, extended from Cumberland, Maryland, to Vandalia, Illinois. Authorized in 1802 as a government project, it was financed out of proceeds from the sale of public lands. Construction was begun in 1811. This road crossed Indiana at about the present location of U. S. Highway 40 and reached Vandalia in 1838. This road provided an east-west approach for the Wabash Basin and facilitated travel and movement of goods to and from the area. Canals also contributed to the economic growth and development of the Basin. The Erie Canal, completed in 1825, permitted travel and movement of goods by water from the Hudson River to Lake Erie. This canal reduced the cost of moving a ton of goods between New York City and Buffalo, New York, from about $100.00 to less than $9.00. This facilitated movement of materials to the south shore of Lake Erie. Aided by Federal land grants, the State of Ohio took a lead in the building of canals and in 1825 began the construction of some 800 miles of waterways to connect Lake Erie with the Ohio River. One canal crossed the state from Cleveland to Portsmouth. Another crossed the western portion of the state from Toledo to Cincinnati. The success of

the Lake Erie-Ohio River canals in Ohio, prompted the State of Indiana to plan the construction of the Wabash Canal to provide a waterway from the Ohio River across the state to join the Ohio canal system in northwest Ohio. Completed in 1853, it did not secure the traffic necessary for its continuance and was abandoned between 1900 and 1915.

By the time the Wabash Canal was opened for shipping, the era of railroad building had begun and shippers were attracted to the faster mode of transportation. Between 1850 and 1860 five railroads had been constructed across Indiana from east to west to link the state with terminals in Chicago and St. Louis. These roads had connecting lines to Cincinnati and to Louisville which gave the Wabash Basin a rail access to shipping on the Ohio River. The increase in rail transport between 1860 and the end of the century brought a decline in shipping on the man-made waterways. Public policy providing public assistance for construction of canal systems had shifted support to the building of railroads.

2. DEVELOPMENTAL DIFFERENCES BETWEEN WHITE AND WABASH BASINS

While the White River is actually a part of the Wabash system, as the two streams join at a point near the town of Mt. Carmel, the two basins are developing some economic differences. As indicated in Table 3 the percentage of the population residing in urban areas of the White Basin was 62.1 per cent in 1960, but is projected to increase to 72.8 per cent in 2010. The percentage of the population residing in urban areas of the Wabash Basin was 49.7 per cent in 1960, and is projected to reach a 60.4 per cent share in 2010. This will seemingly occur while the population is increasing about 13.6 per cent per decade in the White Basin compared to a similar growth of about 8.9 per cent for the Wabash Basin. This would indicate that the White Basin is pulling away from the agricultural economic base at a rate somewhat faster than that for the Wabash Basin. That trend is indicated also in the data compiled in Tables 1 and 2. For the total Wabash Basin, i.e., the Wabash and White basins combined, agriculture provided employment for 217,300 persons in 1930, but provided employment for only 97,200 persons in 1960. This occurred at a time when total employment was increasing from 894,200 to 1,159,300. Employment losses in agriculture were more than compensated by increases in other employment classifications, particularly in Trade, Services, and in Manufacturing. Forces in effect today suggest that this trend will continue. Farming, from the standpoint of crop values, will continue to grow in importance in the total Wabash Basin. But as an economic activity providing employment opportunities for an increasing population, it will become relatively less important. Factors influencing this condition would include better seeds, better tillage, greater use of scientific knowledge, and more productivity per farm worker due to more mechanization and improving farm management.

3. POPULATION, PROJECTED GROWTH AND DISTRIBUTION IN THE WABASH BASIN

In total, the population of the Wabash Basin has shown a rather steady growth. From 1930 to 1960, the population increase in absolute numbers was from 2,363,400 to 3,145,300, an increase of 781,900. The population increase during those three decades was at the rate of about 26,063 each year. The percentage increase shown by the 1960 census over the 1930 count is about 33.1 per cent. An examination of the pertinent census data for 1940, and 1950, will indicate that the population increases were not in the form of a steady upward trend. Census records reflect a below normal birth rate during the 1930's with an above normal birth rate for the 1940's. The above normal birth rate continued through the 1950's.

A consideration of the 33.1 per cent growth for the thirty-year period can have value for projection purposes as it tends to level out the effects of the depression and also of World War II. A 33.1 per cent increase for thirty years can be viewed for projection purposes as an increase at the rate of 1.1 per cent each year. National growth projections and other factors indicate that the Wabash Basin population growth during the years ahead should exceed the 1.1 per cent annual rate.

Preliminary projections provided by the A. D. Little study indicate that the population of the Wabash Basin, including the White Basin, will reach a total of 5,454,600 in the year 2010. Straight line projections from a population count of 3,145,300 in 1960 to the projection of 5,454,600 will show a growth by decade as indicated in Table 4. These projections indicate that the Basin will have a population in 2010, some 73.4 per cent greater than the census count in 1960, which can be viewed as an annual growth of 1.47 per cent. It will be noted that the rate of growth of the White River Basin is significantly higher than that of the Wabash River Basin.

On the basis of these projections, the expected annual increase within the total Wabash Basin is 46,186, which is considered to be a conservative projection in the light of other projections that have been made for the total Ohio River Basin, and for the nation as a whole. Preliminary data from the A. D. Little study show a projection for the Ohio River Basin from 19,001,000 in 1960 to 31,713,000 in the year 2010, an increase of 12,712,000 persons. This projection indicates a growth of 70 per cent for the total Ohio River Basin during the fifty-year time period, or an increase at an annual rate of 1.4 per cent. Inasmuch as the total land area of the Ohio River Basin contains sub-areas with lower economic potential than that of the Wabash and White sub-areas, it could be assumed that the Wabash Basin in total will have a greater rate of growth during the fifty-year projection period.

Another preliminary projection furnished by the A. D. Little study indicates that the total population of the United States should increase from 179,800,000 in 1960 to 378,200,000 in 2010, an increase of 110.3 per cent. This increase suggests an annual rate of increase for the nation of 2.2. per cent.

It is well established in economics that communities which can provide increasing employment opportunities, have a population growth potential. In the free enterprise system, factors of production (labor is one such factor) move in response to demand. Communities that can maintain employment opportunities on a continuing and on an increasing basis, will experience an increase in their populations. An increase in population would come then as a direct result of a demand for employment in a given community. While the population in the total Wabash Basin is generally upward as indicated above, the geographical pattern of increase is not a consistent one. Table 5 indicates something of the pattern by considering employment data by counties. Of the 18 counties situated in the State of Illinois, Champaign, Coles, and Vermilion provided almost twenty per cent of the employment in the Sub-Area in 1960. Those three counties also accounted for about twenty per cent of the population in 1960. The proposed Lincoln Reservoir is located in Coles and Cumberland Counties and would also benefit Crawford, Jasper, and Lawrence Counties which have a downstream location.

Among the Wabash Basin counties situated in the State of Indiana, five provided almost 24 percent of the employment in the Sub-Area in 1960. Those counties, Grant, Howard, Kosciusko, Tippecanoe, and Wabash, have also shown gains in employment since 1930. Another county making a significant contribution to the total population as well as employment in the Wabash Sub-Area is Vigo in which the City of Terre Haute is located.

Except for the nine counties mentioned above, employment growth in the Wabash Sub-Area has been somewhat evenly distributed, ranging from about 3,000 to about 8,000 in each county as reported by the 1960 census. There is also a comparable evenness in the distribution of the Sub-Area's population.

In the White Basin Sub-Area, nine counties out of thirty-three accounted for about 70 per cent of the Sub-Area's employment in 1960. Marion County (Indianapolis) contributed 41.4 per cent. Employment in those nine counties in 1960 ranged from a count of 15,200 for Hendricks County to 278,400 for Marion County. Among the other twenty-four counties, the employment count range was from 2,300 in Brown County to 14,500 in Knox County.

The Clifty Creek Project would provide for construction of a dam in Bartholomew County of Indiana. In addition it would have a downstream benefit for Jackson, Lawrence, Martin, Daviess, and Knox Counties in Indiana.

The proposed Patoka Project with location in Dubois County of Indiana, would have a downstream benefit for Pike and Gibson Counties.

4. DEVELOPMENT TRENDS

With respect to economic acitvities, the Wabash River Basin has been undergoing some significant changes. As reported in the first interim report, the Basin has been primarily an agricultural area. From the standpoint of dollar value for its agricultural production, the Wabash Basin will become increasingly more important to the national economy. From the standpoint of providing employment for the labor force of its growing population, however, agriculture is becoming less important in this area. The following tabulations are indicative of both the importance and the change.

1949 Dollar value of farm production sales

Wabash Basin in State of Illinois	$ 172,156,000
Wabash Basin in State of Indiana	255,540,000
Total	$ 427,696,000
White Basin, State of Indiana	$ 245,189,000
Total, Wabash Basin	$ 672,885,000

Number of employees in Agriculture, Wabash Basin in 1950: 150,900

$672,885,000 ÷ 150,900 = Average contributions per farm worker = $4,459.00

1959 Dollar value of farm production sales

Wabash Basin in State of Illinois	$ 221,523,000
Wabash Basin in State of Indiana	$ 321,596,000
Total	$ 543,119,000
White Basin, State of Indiana	$ 313,792,000
Total, Wabash Basin	$ 856,911,000

Number of employees in Agriculture,

Wabash Basin 1960: 97,200

$856,911,000 ÷ 97,200 = average contributions per farm worker = $8,816.00

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The foregoing preliminary tabulations are necessarily inexact because of the nature of the data used. The Bureau of the Census conducts an Agriculture Census every fifth year and for the calendar years ending in '4' and '9' . Census data for Agriculture is therefore available for the years, 1949, 1954, and 1959. Population and Housing censuses are taken every ten years, and for the years ending in '0'. Data for the foregoing tabulations were drawn from preliminary reports of Arthur D. Little, Inc., and from compilations resulting from Agriculture Censuses of 1949 and 1959. It is recognized that a comparison of 1949 and 1959 dollar sales with employment counts for 1950 and 1960 is statistically incorrect, but more exact data is not immediately available. The tabulations are presented at this time to indicate a trend.

It is significant that in the economic growth and development of the land area drained by the Wabash and tributary streams, the total value of farm products sold has been increasing while the number of persons accounting for that production has been decreasing.

As indicated in Table 1, both population and employment showed increases between 1930 and 1960. Table 1 indicates also the distribution of employment among ten Standard Industrial Code Classifications. It is to be noted that employment increased in the construction, transportation, trade, finance, services, and manufacturing. The most significant increases were reported in trade, services, and manufacturing. Those activities are conterminous with urban development and presumably will increase in the future as urban population increases. Table 3 indicates the trend toward urban living in the Wabash Basin. In 1960 some 56.7 per cent of the population resided in towns and cities. That percentage is projected upward to 61.9 in 1980 and up to 68.1 in 2010. As indicated in Table 3, the White Basin portion of the Wabash Basin has a faster rate of change in the direction of urban residence. The 2010 preliminary projection indicates that 72.8 per cent of the White Basin population will then be residing in urban areas. The Wabash Basin is in a good position for continued growth and development in trade and in manufacturing. As indicated in Table 1, those employment classifications had a historical record of growth up to 1960.

Another view of the economic activities of the Wabash Basin is provided by census tabulations from which the following schedule has been drawn.

	Value Added by Manufacturing, 1954 (000)	Value Added by Manufacturing, 1958 (000)	Total Retail Sales, 1954 (000)	Total Retail Sales, 1958 (000)
Wabash Basin in Illinois	$171,803	$215,087	$506,076	$579,549
Wabash Basin in Indiana	539,190	674,291	816,421	925,683
	$710,993	$889,378	$1,322,497	$1,505,232
White Basin, Indiana	1,586,675	1,816,163	1,759,169	1,997,993
Totals, Wabash Basin	$ 2,297,668	$ 2,705,541	$ 3,081,666	$ 3,503,225

These data help explain the upward trend of economic activities within the Wabash Basin, particularly those of employment in manufacturing and trade. Manufacturing is a basic employment which sets in motion demands that can be served by business activities in construction, transportation, services, and in finance. Growth in retail trade is one indication of a general betterment in the standard of living of the population of the Wabash Basin. It is also an indication of a growing capacity for consumption of goods and services produced in the Basin.

As indicated in the schedule above, the value added by manufacturing in the Basin increased significantly in 1958 over 1954. Out of a total of 77 counties in the Wabash including the White Basin, only 15 had census reports lower for manufacturing in 1958. The counties that did not surpass their 1954 manufacturing outputs were Cumberland, Edgar, Edwards, Richland, and White in Illinois; and Gibson, Lawrence, Morgan, Orange, Washington, Cass, Parke, Pulaski, Tipton, and Vermillion in Indiana.

While there are a few counties that showed slightly lower retail sales in 1958 in relation to 1954, the pattern of increases in consumer purchases was generally upward. The counties that showed a decrease in retail sales in 1958 in relation to 1954 were Edwards and Lawrence in Illinois, and Fulton, Jay, Warren, Wells, Pike and Washington in Indiana. The last two named are situated in the White Basin portion of the Wabash Basin.

From a consideration of pertinent economic data, it can be stated that the Wabash Basin is an agricultural carpet studded with small, medium, and a few large cities. This would appear to be a factor pointing toward the continued economic growth and importance of the Wabash Basin. With an agricultural base permitting the production of a variety of crops, natural resources, adequate transportation potential, available plant sites, proximity to both the industrial developments along the main stem of the Ohio River and the Great Lakes industrial complex, the economic role of the Wabash Basin should increase in importance.

Table 1 Population and Employment in the Wabash and White Basins, 1930, 1940, 1950, and 1960, by Standard Industrial Code Classifications

	1930		1940		195	
	Population	Employment	Population	Employment	Population	E
Totals for Wabash Basin	2,363,400	894,200	2,484,300	817,400	2,740,100	
Wabash Basin, Excluding White	1,130,600	411,500	1,173,700	378,800	1,256,100	
White Basin	1,232,800	482,700	1,310,600	438,600	1,484,000	

Employment by Standard Industrial Code Classifications

	1930			1940				
	White	Wabash	Total	White	Wabash	Total	White	Wa
Agriculture	93,600	123,700	217,300	73,600	102,000	175,600	61,300	8
Mining	11,000	15,400	26,400	6,600	11,500	18,100	7,500	1
Construction	29,400	20,900	50,300	20,900	17,400	38,300	30,300	2
Transportation	31,100	31,300	62,400	31,700	27,800	59,500	43,500	3
Wholesale and Retail Trade	61,900	48,100	110,000	76,400	60,500	136,900	105,800	8
Finance, Insurance & Real Estate	12,900	7,500	20,400	13,700	7,500	21,200	18,200	
Services, Business & Personal	81,600	66,500	148,100	76,600	66,800	143,400	93,100	8
Government	12,600	8,700	21,300	16,100	12,500	28,600	21,700	1
Unreported	15,000	14,200	29,200	7,800	6,800	14,600	10,000	
Manufacturing	133,600	75,400	209,000	115,000	66,300	181,300	182,400	10

Source: Preliminary report, A.D. Little study

and Employment in the Wabash and
ns, 1930, 1940, 1950, and 1960,
d Industrial Code Classifications

1940		1950		1960	
lation	Employment	Population	Employment	Population	Employment
4,300	817,400	2,740,100	1,033,300	3,145,300	1,159,300
3,700	378,800	1,256,100	459,700	1,362,400	487,800
0,600	438,600	1,484,000	573,600	1,782,900	671,500

1940		1950			1960		
Wabash	Total	White	Wabash	Total	White	Wabash	Total
102,000	175,600	61,300	89,600	150,900	40,200	57,000	97,200
11,500	18,100	7,500	11,700	19,200	4,000	7,000	11,000
17,400	38,300	30,300	24,500	54,800	34,600	24,200	58,800
27,800	59,500	43,500	37,900	81,400	41,900	33,700	75,600
60,500	136,900	105,800	81,800	187,600	121,300	86,800	208,100
7,500	21,200	18,200	9,000	27,200	26,800	12,700	39,500
66,800	143,400	93,100	82,500	175,600	121,400	103,900	225,300
12,500	28,600	21,700	14,100	35,800	29,600	16,100	45,700
6,800	14,600	10,000	7,900	17,900	29,200	14,700	43,900
66,300	181,300	182,400	100,900	283,300	221,700	131,400	353,100

TABLE 1

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TABLE 2. EMPLOYMENT IN THE W

	Agriculture				Mining				Construction				Transportation				Wholes
	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930
Persons Employed in Counties of Wabash Basin in the State of Illinois																	
Champaign	6,200	4,900	4,500	3,400	0	0	0	0	1,600	1,700	2,000	2,300	1,800	1,800	2,500	3,500	3,400
Clark	3,000	2,700	2,500	1,300	300	300	400	200	300	300	400	300	300	300	400	400	600
Clay	2,700	2,000	1,800	1,000	0	700	700	500	200	300	300	300	400	400	500	400	500
Coles	3,400	2,800	2,400	1,500	0	200	200	200	700	600	800	800	1,900	1,800	2,400	1,900	1,600
Crawford	2,400	2,000	1,700	1,000	900	600	500	400	300	200	400	500	400	400	600	500	800
Cumberland	2,100	1,900	1,700	900	0	0	100	100	200	100	200	100	200	200	200	200	300
Douglas	2,700	2,100	2,000	1,300	0	0	0	0	300	300	400	400	600	600	600	500	700
Edgar	3,800	3,000	2,600	1,900	0	0	100	0	600	400	600	500	500	500	600	600	1,000
Edwards	1,400	1,200	1,000	700	0	100	300	300	100	100	200	100	100	100	200	100	300
Effingham	2,800	2,600	2,200	1,500	0	400	200	200	300	400	500	600	500	500	600	500	700
Hamilton	2,900	2,200	1,700	800	0	100	300	300	100	200	200	200	100	100	200	200	300
Jasper	2,800	2,800	2,100	1,300	0	0	100	100	100	100	300	100	100	100	300	200	300
Lawrence	2,000	1,900	1,200	800	700	600	500	400	300	0	800	300	300	300	400	400	600
Richland	2,100	1,800	1,500	1,000	0	700	700	500	200	300	300	300	200	400	400	500	500
Vermilion	5,800	4,000	3,900	2,600	3,400	2,300	500	300	1,900	1,000	1,600	1,900	3,100	2,700	3,200	2,700	4,400
Wabash	1,500	1,100	800	600	100	400	800	500	200	100	300	200	600	500	500	600	500
Wayne	3,800	3,100	2,600	1,400	0	500	700	500	200	200	400	300	100	200	300	400	500
White	3,200	2,300	1,900	1,200	100	500	1,200	900	300	200	400	300	300	300	400	500	500
Total	54,600	44,000	38,100	24,200	5,500	7,400	7,300	5,400	7,900	6,500	10,100	9,500	11,500	11,200	14,300	14,100	17,500
Persons Employed in Counties of Wabash Basin in the State of Indiana																	
Benton	2,100	1,900	1,700	1,400	0	0	100	0	200	200	300	200	300	200	200	200	400
Blackford	1,200	1,000	900	500	0	0	0	0	200	200	200	200	200	200	200	200	600
Carroll	2,500	2,200	2,100	1,300	0	0	0	0	300	300	400	400	300	200	500	300	800
Cass	3,100	2,500	2,200	1,500	100	100	0	0	700	600	700	700	1,900	1,600	2,000	1,700	1,700
Clinton	3,100	2,600	2,300	1,500	0	0	0	0	600	500	600	500	1,000	1,200	1,700	1,200	1,100
Fountain	2,500	2,000	1,700	1,000	100	200	100	0	300	300	400	400	400	300	600	300	700
Fulton	2,500	2,200	2,200	1,200	0	0	0	0	300	200	300	500	300	300	400	300	600
Grant	3,200	2,700	2,300	1,400	0	0	0	100	900	800	1,000	1,100	900	900	1,500	1,300	2,400
Howard	2,400	2,000	1,800	1,100	100	0	0	0	900	500	800	1,000	700	600	900	1,000	2,400
Huntington	2,800	2,600	2,400	1,500	0	0	0	0	500	400	500	500	1,100	800	1,000	900	1,100
Jay	2,900	2,400	2,000	1,100	100	0	0	0	300	300	400	300	200	200	400	300	800
Kosciusko	4,000	3,800	3,300	2,100	0	0	0	0	600	500	700	700	500	500	700	800	1,000
Miami	2,700	2,400	2,100	1,400	0	0	0	0	500	400	500	500	1,800	1,300	1,900	1,300	1,400
Montgomery	3,400	2,900	2,400	1,600	0	0	0	0	600	500	700	600	500	500	600	500	1,200
Parke	2,500	2,000	1,800	1,100	300	300	200	100	200	200	300	300	300	400	400	300	400
Pulaski	2,200	2,200	1,900	1,200	0	0	0	0	200	200	300	300	200	100	300	300	300
Sullivan	3,000	1,700	1,700	1,100	2,600	1,200	1,400	600	300	300	400	500	300	300	500	500	800
Tippecanoe	3,100	2,600	2,400	1,700	100	0	0	0	1,200	1,000	1,700	1,500	1,900	1,500	2,000	1,300	2,600
Tipton	2,200	1,900	1,600	1,100	0	0	0	0	300	200	300	200	600	300	400	300	500
Vermillion	1,600	1,100	900	600	2,500	700	900	200	300	200	300	500	700	500	800	400	800
Vigo	3,200	1,900	1,700	1,200	3,900	1,600	1,700	600	2,100	1,600	1,700	1,900	4,100	3,300	4,700	3,700	6,000
Wabash	2,800	2,500	2,500	1,500	0	0	0	0	500	400	500	600	500	400	600	600	1,000
Warren	2,000	1,600	1,400	800	0	0	0	0	100	100	200	100	200	100	100	100	200
Wells	2,800	2,600	2,100	1,400	100	0	0	0	300	400	400	400	300	300	400	400	700
White	2,600	2,400	2,000	1,400	0	0	0	0	300	300	400	400	300	400	400	400	500
Whitley	2,700	2,300	2,100	1,100	0	0	0	0	300	300	400	400	300	200	400	500	600
Total	69,100	58,000	51,500	32,800	9,900	3,900	4,400	1,600	13,000	10,900	14,400	14,700	19,800	16,600	23,600	19,600	30,600
Persons Employed in Counties of White Basin in the State of Indiana																	
Bartholemew	3,000	2,300	1,700	1,300	0	0	0	0	500	500	700	800	400	500	700	800	1,100
Boone	3,400	3,000	2,700	1,500	0	0	0	0	600	400	600	700	800	400	600	400	900
Brown	1,200	800	500	200	0	0	0	0	100	100	200	200	100	100	100	100	100
Clay	2,200	1,600	1,500	800	1,200	900	900	400	300	200	400	300	400	400	300	500	900
Daviess	3,300	2,900	2,200	1,500	200	200	300	100	500	300	400	500	800	1,000	1,300	1,100	800
Decatur	2,700	2,400	2,000	1,500	200	100	0	100	300	300	400	400	400	300	400	400	700
Delaware	3,200	2,500	2,100	1,500	100	0	0	0	1,600	1,100	1,500	1,700	1,500	1,500	2,100	2,300	3,300
Dubois	2,700	2,300	2,200	1,400	100	100	100	100	300	300	500	500	300	300	400	500	500
Gibson	3,500	2,600	2,300	1,500	900	900	1,100	600	500	400	500	500	600	900	900	600	900
Greene	3,300	2,300	1,900	1,300	2,100	1,200	1,300	500	600	400	500	700	500	500	700	600	1,000
Hamilton	3,300	3,000	2,500	1,600	0	0	0	100	500	500	800	900	300	400	600	700	1,000
Hancock	2,400	2,000	1,500	1,200	0	0	0	0	400	400	600	700	500	400	500	500	800
Hendricks	3,200	2,700	2,300	1,500	0	0	0	0	400	400	600	900	400	300	600	1,400	700
Henry	3,300	2,500	2,200	1,500	0	0	0	0	700	600	600	600	500	500	700	700	1,400
Jackson	3,100	2,500	2,000	1,200	0	0	0	0	500	400	600	600	500	600	700	600	900
Jennings	2,000	1,800	1,500	600	100	0	0	0	300	200	200	300	400	300	500	400	300
Johnson	2,800	2,400	1,800	1,200	0	0	0	0	400	300	600	1,100	300	400	600	1,100	900
Knox	4,200	3,200	2,500	2,000	1,800	1,200	1,200	400	800	600	1,000	800	700	800	1,100	1,100	1,900
Lawrence	2,400	1,300	1,200	800	1,100	200	200	200	600	300	600	800	700	500	1,300	600	1,100
Madison	3,700	2,800	2,400	1,800	200	0	0	100	1,800	1,100	1,500	1,700	1,500	1,400	1,900	1,700	3,600
Marion	4,000	2,900	2,600	1,800	400	200	200	200	13,400	8,600	12,900	14,100	15,800	10,800	22,500	20,600	31,900
Martin	1,700	1,100	700	400	100	100	100	0	200	200	100	200	100	100	200	200	200
Monroe	2,100	1,200	900	600	900	400	600	400	800	500	800	1,300	800	600	900	1,000	1,200
Morgan	2,900	2,300	1,800	1,200	0	0	0	0	300	400	600	800	300	300	600	900	700
Orange	2,400	1,900	1,500	900	100	0	100	100	300	200	300	400	300	200	300	300	500
Owen	1,900	1,500	1,300	600	200	100	200	100	200	200	300	300	200	200	300	200	300
Pike	2,200	1,300	900	600	1,100	900	1,100	600	200	200	200	300	200	300	300	300	400
Putnam	3,700	2,400	2,100	1,400	100	100	100	0	500	400	400	400	400	400	500	500	700
Randolph	3,200	2,900	2,500	1,600	0	0	0	0	500	400	500	400	400	400	500	400	1,000
Rush	3,000	3,600	2,300	1,600	0	0	0	0	300	300	300	300	300	300	400	300	600
Scott	1,200	1,000	900	400	0	0	0	0	100	100	200	300	100	100	200	200	200
Shelby	3,400	2,900	2,400	1,700	0	0	0	0	600	400	600	800	400	400	600	700	1,000
Washington	3,000	2,700	2,400	1,500	100	0	0	0	300	200	300	300	200	100	200	200	400
Total	93,600	73,600	61,300	40,200	11,000	6,600	7,500	4,000	29,400	20,900	30,300	34,600	31,100	31,700	43,900	41,900	61,900

Source: Preliminary report, A. D. Little study

TABLE 2. EMPLOYMENT BY STANDARD INDUSTRIAL CODE CLASSIFICATIONS BY COUNTIES IN THE WABASH AND WHITE RIVER BASINS FOR 1930, 1940, 1950 AND 1960

Construction			Transportation				Wholesale & Retail Trade				Finance, Insurance and Real Estate				Services, Business and Personal				Government		
1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950
1,700	2,000	2,300	1,800	1,800	2,500	3,500	3,400	4,900	7,200	7,100	600	700	800	1,300	6,900	7,200	13,000	18,500	1,300	4,500	2,100
300	400	300	300	300	400	400	600	800	1,000	1,000	100	100	100	100	800	800	900	900	100	100	200
300	300	300	400	400	500	400	500	800	1,000	1,100	100	100	100	100	600	600	800	900	100	100	200
600	800	800	1,900	1,800	2,400	1,900	1,600	2,400	3,100	3,200	200	300	300	400	2,100	1,400	2,800	3,700	300	300	400
200	400	500	400	400	600	500	800	900	1,200	1,200	100	100	100	200	1,000	1,200	1,100	1,300	100	100	200
100	200	100	200	200	200	200	300	300	400	500	0	0	0	100	500	400	400	500	100	100	100
300	400	400	600	600	600	500	700	900	1,200	1,100	100	100	100	100	1,000	1,000	900	1,200	100	100	200
400	600	500	500	500	600	600	1,000	1,200	1,600	1,700	200	200	200	200	1,400	1,400	1,300	1,400	200	200	200
100	200	100	100	100	200	100	300	300	500	500	0	0	100	0	400	300	400	400	100	100	100
400	500	600	500	500	600	500	700	1,100	1,500	1,900	100	100	100	200	900	1,100	1,200	1,300	100	200	200
200	200	200	100	100	200	200	300	400	500	400	0	0	100	100	400	500	500	400	100	100	100
100	300	100	100	100	300	200	300	400	600	600	100	0	0	100	400	500	400	500	100	100	100
0	300	300	300	300	400	400	600	700	1,100	1,100	100	100	100	200	900	800	1,000	1,200	100	0	200
300	300	300	200	400	400	500	500	900	1,100	1,100	100	100	100	100	800	1,000	900	1,200	100	100	100
1,000	1,600	1,900	3,100	2,700	3,200	2,700	4,400	4,900	6,400	6,600	600	600	700	1,000	5,900	5,600	6,100	6,800	600	700	900
100	300	200	600	500	500	600	500	700	900	1,000	100	100	100	100	600	900	800	1,200	100	100	100
200	400	300	100	200	300	400	500	800	1,000	1,100	100	100	100	100	600	900	800	1,200	100	100	200
200	400	300	300	300	400	500	500	900	1,300	1,300	100	100	100	200	700	900	1,000	1,300	100	100	200
6,500	10,100	9,500	11,500	11,200	14,300	14,100	17,500	23,300	31,600	32,500	2,700	2,800	3,200	4,600	25,900	27,200	34,200	43,700	3,800	7,100	5,800
200	300	200	300	200	200	200	400	600	700	700	100	100	100	100	700	500	600	700	100	100	100
200	200	200	200	200	200	200	600	700	700	1,000	100	100	100	100	600	700	700	600	100	100	100
300	400	400	300	200	500	300	800	700	700	1,100	100	100	100	200	700	600	700	1,000	100	100	100
600	700	700	1,900	1,600	2,000	1,700	1,700	2,300	2,700	2,800	200	300	300	400	2,100	2,300	2,400	3,100	400	300	400
500	600	500	1,000	1,200	1,700	1,200	1,100	1,400	1,800	2,000	200	200	300	400	1,400	1,300	1,400	1,700	200	200	300
300	400	400	400	300	600	300	700	800	1,100	1,100	100	100	100	100	900	900	1,000	1,000	100	100	200
200	300	500	300	300	400	300	600	700	1,100	1,100	100	100	100	100	800	900	900	1,000	100	100	200
800	1,000	1,100	900	900	1,500	1,300	2,400	2,700	3,900	4,300	400	400	500	900	3,300	3,000	4,200	5,600	400	400	600
500	800	1,000	700	600	900	1,000	2,400	2,500	3,700	4,000	400	300	500	700	2,600	2,300	2,800	3,800	300	300	500
400	500	500	1,100	800	1,000	900	1,100	1,500	1,900	2,100	200	100	200	300	1,500	1,600	1,800	2,000	200	200	300
300	400	300	200	200	400	300	800	1,100	1,300	1,300	100	100	100	200	900	1,000	1,000	1,100	100	200	200
500	700	700	500	500	700	800	1,000	1,400	2,000	2,700	100	200	200	400	1,400	1,500	1,900	2,500	200	200	200
400	500	500	1,800	1,300	1,900	1,300	1,400	1,400	1,600	2,000	200	200	200	300	1,900	1,300	1,300	1,800	200	200	300
500	700	600	500	500	600	500	1,200	1,600	2,000	2,200	300	300	300	400	1,700	1,600	1,800	2,200	200	200	300
200	300	300	300	400	400	300	400	600	800	800	100	100	100	100	900	900	800	900	100	100	200
200	300	300	200	100	300	300	300	500	600	900	100	0	100	100	500	500	400	800	100	100	100
300	400	500	300	300	500	500	800	900	1,100	1,300	100	100	100	200	1,000	1,000	1,000	1,300	100	200	300
1,000	1,700	1,500	1,900	1,500	2,000	1,800	2,600	3,300	5,500	5,800	500	500	700	1,000	4,700	5,300	8,800	12,800	400	500	800
200	300	200	600	300	400	300	500	600	800	700	100	100	100	100	700	700	700	800	100	100	100
200	300	500	700	500	800	400	800	800	1,100	1,200	100	100	100	100	1,100	800	900	1,000	100	200	400
1,600	1,700	1,900	4,100	3,300	4,700	3,700	6,000	7,100	9,400	8,400	700	800	1,000	1,100	7,300	6,800	8,200	8,200	700	900	1,800
400	500	600	500	400	600	600	1,000	1,300	1,900	2,100	200	100	200	200	1,400	1,500	1,800	2,100	200	200	200
100	200	100	200	100	100	100	200	200	400	400	0	0	0	0	400	400	400	500	100	100	100
400	400	400	300	300	400	400	700	900	1,200	1,500	100	100	100	200	700	800	1,100	1,300	100	100	200
300	400	400	300	400	400	400	500	800	1,100	1,400	100	100	100	200	700	700	800	1,100	100	100	100
300	400	400	300	200	400	500	600	800	1,100	1,400	100	100	100	200	700	700	900	1,300	100	100	200
10,900	14,400	14,700	19,800	16,600	23,600	19,600	30,600	37,200	50,200	54,300	4,800	4,700	5,800	8,100	40,600	39,600	48,300	60,200	4,900	5,400	8,300
500	700	800	400	500	700	800	1,100	1,400	2,200	2,900	100	100	200	400	1,300	1,200	1,600	2,500	200	200	400
400	600	700	800	400	600	400	900	1,100	1,700	1,900	200	200	200	400	1,200	1,100	1,300	1,600	200	200	300
100	200	200	100	100	100	100	100	100	200	300	0	100	0	100	200	200	200	400	0	0	100
200	400	300	400	400	300	500	900	1,000	1,300	1,500	100	100	100	100	1,100	1,000	1,100	1,500	200	200	300
300	400	500	800	1,000	1,300	1,100	800	1,100	1,400	1,600	100	100	200	200	1,100	1,000	1,100	1,500	100	200	500
300	400	400	400	300	400	400	700	900	1,200	1,400	100	100	100	200	800	1,000	1,000	1,200	100	100	200
1,100	1,500	1,700	1,900	1,500	2,100	2,300	3,300	4,500	6,400	7,500	500	500	800	1,100	4,000	4,100	5,500	8,200	400	500	700
300	500	500	300	300	400	500	500	800	1,200	1,400	100	100	100	200	800	800	1,200	1,600	100	100	200
400	500	500	600	900	900	600	900	1,200	1,800	1,800	200	100	200	300	1,300	1,300	1,600	1,700	200	200	200
400	500	700	500	500	700	600	1,000	1,300	1,500	1,700	100	100	200	200	1,300	1,200	1,200	1,300	200	200	700
500	800	900	300	400	600	700	1,000	1,300	1,900	3,000	200	200	300	700	1,200	1,200	1,500	2,500	100	200	300
400	600	700	500	400	500	500	800	900	1,300	1,700	100	100	200	400	900	900	1,000	1,400	200	200	300
400	600	900	400	300	600	1,400	700	1,000	1,500	2,600	200	200	300	700	1,000	1,000	1,500	2,300	200	300	400
600	600	600	500	500	700	700	1,400	1,800	2,500	3,000	200	200	300	400	2,500	1,900	2,300	2,800	200	300	400
400	600	600	500	600	700	600	900	1,100	1,600	1,900	100	100	200	200	1,100	1,100	1,300	1,600	200	100	300
200	200	300	400	300	500	400	300	400	500	600	0	0	0	100	500	400	600	1,000	100	100	100
300	600	1,100	300	400	600	1,100	900	1,100	1,800	2,900	200	200	300	600	1,300	1,200	1,500	2,700	100	200	400
600	1,000	800	700	800	1,100	1,100	1,900	2,300	3,200	3,200	300	300	300	400	2,200	2,200	2,400	2,800	300	300	300
300	600	800	700	500	1,300	600	1,100	1,400	1,700	2,100	200	200	200	300	1,500	1,400	1,400	1,700	200	300	700
1,100	1,500	1,700	1,500	1,400	1,900	1,700	3,600	4,700	6,800	7,400	600	600	800	1,100	4,400	4,100	5,400	6,500	1,100	800	1,100
8,600	12,900	14,100	15,800	16,800	22,500	20,600	31,900	37,400	50,800	54,800	8,200	9,100	11,700	16,300	40,000	36,700	42,400	52,500	6,800	9,700	10,800
200	100	200	100	100	200	200	200	200	300	400	0	0	0	100	300	300	300	400	100	100	700
500	800	1,300	800	600	900	1,000	1,200	1,700	2,700	3,300	200	200	200	400	2,300	2,400	5,700	8,900	200	300	500
400	600	800	300	300	600	900	700	800	1,300	2,100	100	100	200	400	1,100	1,000	1,300	1,800	100	100	200
200	300	400	300	200	300	300	500	600	700	900	100	100	100	100	1,600	1,100	1,000	1,400	100	100	200
200	300	300	200	200	300	200	300	500	500	600	0	0	0	0	400	400	500	500	100	100	100
200	200	300	200	300	300	300	400	500	600	700	100	0	100	100	600	600	600	600	100	100	100
400	400	400	400	400	500	500	700	900	1,200	1,400	100	100	100	300	1,200	1,200	1,600	2,100	200	200	300
400	500	400	400	400	500	400	1,000	1,300	1,600	1,700	200	200	200	300	1,300	1,300	1,400	1,600	200	200	200
300	300	300	300	300	400	300	600	800	1,000	1,200	100	100	100	200	1,000	1,100	1,000	1,300	100	100	200
100	200	300	100	100	200	200	200	300	600	700	0	0	100	100	300	300	400	600	0	100	100
400	600	800	400	400	600	700	1,000	1,400	2,000	2,000	200	200	300	300	1,300	1,300	1,600	2,100	100	200	300
200	300	300	200	100	200	200	400	500	700	1,000	0	0	100	100	500	600	600	800	100	100	100
20,900	30,300	34,600	31,100	31,700	43,500	41,900	61,900	76,400	105,800	121,300	12,900	13,700	18,200	26,800	81,600	76,600	93,100	121,400	12,600	16,100	21,700

TICATIONS BY COUNTIES
1940, 1950 AND 1960

ce, Insurance and Real Estate			Services, Business and Personal				Government				Unreported				Manufacturing			
1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960	1930	1940	1950	1960
700	800	1,300	6,900	7,200	13,000	18,500	1,300	4,500	2,100	3,000	900	400	500	1,600	2,100	1,600	2,600	3,400
100	100	100	800	800	900	900	100	100	200	100	200	200	100	200	400	500	600	900
100	100	100	600	600	800	900	100	100	200	200	200	100	100	100	1,100	700	400	800
300	300	400	2,100	1,400	2,800	3,700	300	300	400	300	400	200	300	400	2,700	2,200	3,000	3,600
100	100	200	1,000	1,200	1,100	1,300	100	100	200	200	200	100	200	100	1,000	1,100	1,800	2,300
0	0	100	500	400	400	500	100	100	100	100	100	100	0	0	200	700	800	1,000
100	100	100	1,000	1,000	900	1,200	100	100	200	200	200	100	200	200	400	400	500	1,400
200	200	200	1,400	1,400	1,300	1,400	200	200	200	300	400	100	400	200	1,100	900	1,100	1,400
0	100	0	400	300	400	400	100	100	100	100	200	100	0	0	400	500	400	500
100	100	200	900	1,100	1,200	1,300	100	200	200	300	200	100	200	100	900	1,000	1,300	1,400
0	100	100	400	500	500	400	100	100	100	100	100	100	100	100	300	600	400	500
0	0	100	400	500	400	500	100	100	100	100	100	100	100	0	200	300	300	600
100	100	200	900	800	1,000	1,200	100	0	200	200	200	200	100	200	1,800	1,100	1,300	1,300
100	100	100	800	1,000	900	1,200	100	100	100	200	100	100	100	100	1,100	900	800	800
600	700	1,000	5,900	5,600	6,100	6,800	600	700	900	1,000	900	400	600	1,000	6,200	4,200	7,600	10,900
100	100	100	600	600	700	1,000	100	100	100	100	200	100	200	100	700	700	700	800
100	100	100	600	900	800	1,200	100	100	200	300	200	100	0	200	1,100	700	900	1,100
100	100	200	700	900	1,000	1,300	100	100	200	200	300	100	100	100	800	600	500	700
2,800	3,200	4,600	25,900	27,200	34,200	43,700	3,800	7,100	5,800	7,000	5,100	2,700	3,300	4,700	22,500	18,700	25,000	33,400
100	100	100	700	500	600	700	100	100	100	100	200	100	0	100	200	100	300	600
100	100	100	600	700	700	600	100	100	100	100	200	100	100	400	1,700	1,600	2,200	2,400
100	100	200	700	600	700	1,000	100	100	100	100	200	100	100	100	400	400	1,100	1,600
300	300	400	2,100	2,300	2,400	3,100	400	300	400	500	400	200	200	200	2,000	3,000	3,400	3,700
200	300	400	1,400	1,300	1,400	1,700	200	200	300	300	300	200	200	500	2,000	1,600	2,300	3,300
100	100	100	900	900	1,000	1,000	100	100	200	200	300	100	100	100	1,000	700	1,300	2,300
100	100	100	800	900	900	1,000	100	100	200	200	200	100	200	200	500	600	1,300	1,600
400	500	900	3,300	3,000	4,200	5,600	400	400	600	600	700	500	600	900	7,300	6,400	8,700	12,200
300	500	700	2,600	2,300	2,800	3,800	300	300	500	800	500	300	200	900	7,400	6,700	10,100	12,000
100	200	300	1,500	1,600	1,800	2,000	200	200	300	300	300	200	100	500	2,500	2,300	4,400	4,800
100	100	200	900	1,000	1,000	1,100	100	200	200	300	400	100	200	600	1,900	2,700	3,200	3,700
200	200	400	1,400	1,500	1,900	2,500	200	200	200	400	400	200	100	600	1,400	1,700	3,400	5,600
200	200	300	1,900	1,300	1,300	1,800	200	200	300	300	300	200	300	600	2,200	1,900	2,700	3,300
300	300	400	1,700	1,600	1,800	2,200	200	200	300	400	400	100	100	100	1,900	1,600	2,800	3,900
100	100	100	900	900	800	900	100	100	200	200	300	100	100	100	700	200	600	1,000
0	100	100	500	500	400	800	100	100	100	100	200	100	100	100	300	200	500	700
100	100	200	1,000	1,000	1,000	1,300	100	200	300	300	300	100	200	200	500	300	600	1,300
500	700	1,000	4,700	5,300	8,800	12,800	400	500	800	900	500	300	500	900	3,400	3,100	5,700	7,100
100	100	100	700	700	700	800	100	100	100	200	100	0	100	200	800	700	1,300	2,000
100	100	100	1,100	800	900	1,000	100	200	400	200	200	100	100	100	900	300	1,000	1,500
800	1,000	1,100	7,300	6,800	8,200	8,200	700	900	1,800	1,700	1,500	300	400	1,600	9,000	6,000	9,300	10,000
100	200	200	1,400	1,500	1,800	2,100	200	200	200	300	400	200	100	400	2,100	2,600	3,900	5,500
0	0	0	400	400	400	500	100	100	100	100	100	0	100	0	200	100	400	800
100	100	200	700	800	1,100	1,300	100	100	200	200	200	100	100	200	1,200	700	1,800	2,500
100	100	200	700	700	800	1,100	100	100	100	200	300	200	200	200	500	600	1,300	1,700
100	100	200	700	700	900	1,300	100	100	200	100	200	100	100	200	900	1,500	2,300	2,900
4,700	5,800	8,100	40,600	39,600	48,300	60,200	4,900	5,400	8,300	9,100	9,100	4,100	4,600	10,000	52,900	47,600	75,900	98,000
100	200	400	1,300	1,200	1,600	2,500	200	200	400	600	600	300	200	700	2,400	3,100	6,000	7,900
200	200	400	1,200	1,100	1,300	1,600	200	200	300	400	200	100	100	300	900	900	1,700	2,700
100	0	100	200	200	200	400	0	0	100	100	0	200	100	100	100	100	500	700
100	100	100	1,100	1,000	1,100	1,500	200	200	300	300	500	100	200	300	2,300	1,000	1,900	2,700
100	200	200	1,100	1,000	1,100	1,500	100	200	500	500	400	100	300	200	1,700	600	1,300	1,500
100	100	200	800	1,000	1,000	1,200	100	100	200	200	200	100	100	100	700	500	1,100	1,800
500	800	1,100	4,000	4,100	5,500	8,200	400	500	700	900	600	300	800	1,300	11,400	11,300	15,200	16,400
100	100	200	800	800	1,200	1,600	100	100	200	200	200	100	400	100	2,000	2,500	2,900	3,800
100	200	300	1,300	1,300	1,600	1,700	200	200	200	300	500	100	100	400	1,200	800	2,100	2,700
100	200	200	1,300	1,200	1,200	1,300	200	200	700	800	400	100	200	200	1,000	600	1,000	1,600
200	300	700	1,200	1,200	1,900	2,500	100	200	300	600	300	100	200	600	1,600	1,600	2,800	4,700
100	200	400	900	900	1,000	1,400	200	200	300	700	200	100	100	400	1,000	1,000	2,000	3,400
200	300	700	1,000	1,000	1,900	2,300	200	300	400	900	200	100	200	400	900	900	1,900	4,400
200	300	400	2,900	1,900	2,300	2,800	200	300	400	400	400	200	100	300	4,400	5,300	7,400	8,200
100	200	200	1,100	1,100	1,300	1,600	200	100	300	300	200	200	200	400	2,100	2,200	3,300	4,400
0	0	100	500	400	600	1,000	100	100	100	200	100	100	100	200	500	500	1,100	1,600
200	300	600	1,300	1,200	1,500	2,700	100	200	400	700	200	200	200	600	1,600	1,400	2,800	5,300
300	300	400	2,200	2,200	2,400	2,800	300	300	300	500	500	300	300	600	2,600	1,900	2,300	2,700
200	200	300	1,500	1,400	1,400	1,700	200	300	700	700	300	100	200	300	3,800	1,800	4,400	4,600
600	800	1,100	4,400	4,100	5,400	6,500	1,100	800	1,100	1,600	900	500	800	3,000	16,500	14,000	21,600	23,800
9,100	11,700	16,300	40,000	36,700	42,400	52,500	6,800	9,700	10,800	14,900	5,100	3,100	3,200	15,700	60,900	50,700	77,000	87,300
0	0	100	300	300	300	400	100	100	700	400	300	0	100	0	400	500	700	1,100
200	200	400	2,300	2,400	5,700	8,900	200	300	500	800	500	200	200	400	3,500	2,000	4,800	5,400
100	200	400	1,100	1,000	1,300	1,800	100	100	200	400	300	200	300	700	1,100	900	2,100	3,400
100	100	100	1,600	1,100	1,000	1,400	100	100	200	200	200	100	100	200	600	600	1,500	1,800
0	0	0	400	400	500	500	100	100	100	100	200	100	100	100	400	300	700	1,000
0	100	100	600	600	600	600	100	100	100	200	200	100	100	100	300	200	500	700
100	100	300	1,200	1,200	1,600	2,100	200	200	300	300	300	100	300	500	1,100	600	1,000	1,700
200	200	300	1,300	1,300	1,400	1,600	200	200	200	200	300	100	100	300	1,900	2,400	3,100	4,200
100	100	200	1,000	1,100	1,000	1,300	100	100	200	200	200	100	200	100	1,100	900	1,700	2,000
0	100	100	300	300	400	600	0	100	100	200	100	0	100	200	300	1,100	1,200	1,900
200	300	300	1,300	1,300	1,600	2,100	100	200	300	600	200	100	100	400	2,500	2,000	3,500	4,400
0	100	100	500	600	600	800	100	100	100	200	200	200	200	100	800	800	1,300	1,900
13,700	18,200	26,800	81,600	76,600	93,100	121,400	12,600	16,100	21,700	29,600	15,000	7,800	10,000	29,200	133,600	115,000	182,400	221,700

TABLE 2

Table 3 Total and Urban Population Comparisons in the White and Wabash Basins for 1960, 1980 and 2010

Basin	1960 Population	1960 Urban Population	1960 Per Cent Urban	1980 Population	1980 Urban Population	1980 Per Cent Urban	2010 Population	2010 Urban Population	2010 Per Cent Urban
White	1,782,900	1,107,900	62.1	2,312,200	1,532,800	66.3	3,393,300	2,469,600	72.8
Wabash	1,362,400	676,500	49.7	1,541,500	853,100	55.3	2,061,300	1,246,300	60.4
Totals	3,145,300	1,784,400	56.7	3,853,700	2,385,900	61.9	5,454,600	3,715,900	68.1

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Table 4 Population Projections for the Wabash Basin for the Years 1970, 1980, 1990, 2000 and 2010, Based on a Preliminary Projection for 2010

Population	Census 1960	Preliminary Projections 1970	1980	1990	2000	2010	Per Cent Increase by 2010	Annual Per Cent Increase
White Basin	1,782,900	2,150,000	2,450,000	2,800,000	3,100,000	3,393,300	90.5	1.80
Wabash Basin excluding White	1,362,400	1,500,000	1,600,000	1,750,000	1,880,000	2,061,300	51.3	1.03
Totals for Wabash Basin	3,145,300	3,650,000	4,050,000	4,550,000	4,980,000	5,454,600	73.4	1.47

Table 5 Total Employment by Counties in the Wabash Basin 1930, 1940, 1950, 1960

	1930		1940		1950		1960	
	Number	% of Basin	Number	% of Basin	Number	% of Basin	Number	% of Basin
Employment in Counties of Wabash Basin in the State of Illinois								
Champaign	24,900	6.0	27,700	7.3	35,200	7.6	44,100	9.0
Clark	6,200	1.5	6,100	1.6	6,600	1.4	5,400	1.1
Clay	5,700	1.3	5,900	1.5	5,800	1.2	5,400	1.1
Coles	13,400	3.2	13,200	3.4	15,600	3.3	16,100	3.3
Crawford	7,200	1.7	6,600	1.7	7,800	1.6	7,500	1.5
Cumberland	3,700	0.8	3,900	1.0	3,900	0.8	3,300	0.6
Douglas	6,000	1.4	5,400	1.4	5,900	1.2	6,700	1.3
Edgar	9,200	2.2	7,900	2.0	8,500	1.8	8,100	1.6
Edwards	3,000	0.7	2,700	0.7	3,200	0.6	2,800	0.5
Effingham	6,600	1.6	7,500	1.9	7,900	1.7	7,900	1.6
Hamilton	4,300	1.0	4,100	1.0	4,100	0.8	3,100	0.6
Jasper	4,100	0.9	4,400	1.1	4,200	0.9	3,700	0.7
Lawrence	7,100	1.7	5,500	1.4	6,700	1.4	6,100	1.2
Richland	5,100	1.2	5,900	1.5	6,100	1.3	5,800	1.1
Vermilion	32,800	7.9	26,400	6.9	31,500	6.8	34,700	7.1
Wabash	4,600	1.1	4,300	1.1	5,100	1.1	5,100	1.0
Wayne	6,700	1.6	6,700	1.7	7,000	1.5	6,700	1.3
White	6,400	1.5	6,000	1.5	7,200	1.5	6,700	1.3
Totals	157,000		150,200		172,300		179,200	
Employment in Counties of Wabash Basin in The State of Indiana								
Benton	4,200	1.0	3,800	1.0	4,000	0.8	4,200	0.8
Blackford	4,900	1.1	4,700	1.2	5,400	1.1	5,600	1.1
Carroll	5,200	1.2	4,900	1.2	5,900	1.2	6,100	1.2
Cass	12,500	3.0	13,100	3.4	14,200	3.0	14,600	2.9
Clinton	10,000	2.4	9,200	2.4	10,900	2.3	11,400	2.3
Fountain	6,500	1.5	5,500	1.4	6,400	1.3	6,500	1.3
Fulton	5,500	1.3	5,200	1.3	6,600	1.4	6,200	1.2
Grant	19,400	4.7	17,700	4.6	23,300	5.0	28,400	5.8
Howard	17,500	4.2	15,600	4.1	21,300	4.6	25,100	5.1
Huntington	10,300	2.5	9,700	2.5	12,700	2.7	12,900	2.6
Jay	7,600	1.8	8,100	2.1	8,800	1.9	8,900	1.8
Koscinsko	9,800	2.3	10,000	2.6	12,700	2.7	15,800	3.2
Miami	11,200	2.7	9,400	2.4	10,900	2.3	11,500	2.3
Montgomery	10,100	2.4	9,400	2.4	11,000	2.3	11,900	2.4
Parke	5,800	1.4	4,800	1.2	5,300	1.1	4,800	0.9

Totals	157,000		150,200		172,300		179,200	
Employment in Counties of Wabash Basin in The State of Indiana								
Benton	4,200	1.0	3,800	1.0	4,000	0.8	4,200	0.8
Blackford	4,900	1.1	4,700	1.2	5,400	1.1	5,600	1.1
Carroll	5,200	1.2	4,900	1.2	5,900	1.2	6,100	1.2
Cass	12,500	3.0	13,100	3.4	14,200	3.0	14,600	2.9
Clinton	10,000	2.4	9,200	2.4	10,900	2.3	11,400	2.3
Fountain	6,500	1.5	5,500	1.4	6,400	1.3	6,500	1.3
Fulton	5,500	1.3	5,200	1.3	6,600	1.4	6,200	1.2
Grant	19,400	4.7	17,700	4.6	23,300	5.0	28,400	5.8
Howard	17,500	4.2	15,600	4.1	21,300	4.6	25,100	5.1
Huntington	10,300	2.5	9,700	2.5	12,700	2.7	12,900	2.6
Jay	7,600	1.8	8,100	2.1	8,800	1.9	8,900	1.8
Koscinsko	9,800	2.3	10,000	2.6	12,700	2.7	15,800	3.2
Miami	11,200	2.7	9,400	2.4	10,900	2.3	11,500	2.3
Montgomery	10,100	2.4	9,400	2.4	11,000	2.3	11,900	2.4
Parke	5,800	1.4	4,800	1.2	5,300	1.1	4,800	0.9
Pulaski	4,000	0.9	3,900	1.0	4,400	0.9	4,400	0.9
Sullivan	9,200	2.2	6,000	1.5	7,500	1.6	7,200	1.4
Tippecanoe	18,600	4.5	18,100	4.7	28,100	6.1	33,500	6.8
Tipton	5,400	1.3	4,600	1.2	5,400	1.1	5,800	1.1
Vermillion	8,400	2.0	4,700	1.2	6,300	1.3	5,900	1.2
Vigo	38,600	9.3	30,400	8.0	39,800	8.6	38,500	7.8
Wabash	9,000	2.1	9,200	2.4	11,700	2.5	13,200	2.7
Warren	3,200	0.7	2,800	0.7	3,000	0.6	2,900	0.5
Wells	6,300	1.5	6,000	1.5	7,500	1.6	8,300	1.7
White	5,500	1.3	5,700	1.5	6,600	1.4	7,000	1.4
Whitley	5,800	1.4	6,100	1.6	7,700	1.6	8,000	1.6
Totals	254,500		228,600		287,400		308,600	
Employment in Counties of White Basin, State of Indiana								
Bartholomew	9,500	1.9	9,400	2.1	13,700	2.3	17,900	2.6
Boone	8,300	1.7	7,400	1.6	9,100	1.5	10,200	1.5
Brown	1,800	0.3	1,600	0.3	1,900	0.3	2,300	0.3
Clay	9,200	1.9	6,500	1.4	8,300	1.4	8,200	1.2
Daviess	8,900	1.8	7,500	1.7	8,900	1.5	8,700	1.2
Decatur	6,200	1.2	5,700	1.2	6,600	1.1	7,200	1.0
Delaware	26,600	5.5	26,300	5.9	35,100	6.1	41,000	6.1
Dubois	7,200	1.4	7,400	1.6	9,100	1.5	9,700	1.4
Gibson	9,800	2.0	8,600	1.9	10,700	1.8	10,400	1.5
Greene	10,500	2.1	8,000	1.8	9,100	1.5	8,800	1.3
Hamilton	8,700	1.8	8,500	1.9	10,900	1.9	15,300	2.2
Hancock	6,400	1.3	6,000	1.3	7,500	1.3	10,200	1.5
Hendricks	7,100	1.4	6,900	1.5	9,200	1.6	15,200	2.2
Henry	13,600	2.8	13,300	3.0	16,500	2.8	18,100	2.6
Jackson	8,600	1.7	8,500	1.9	10,100	1.7	11,400	1.6
Jennings	4,300	0.8	3,900	0.8	4,700	0.8	5,000	0.7
Johnson	7,800	1.6	7,400	1.6	10,000	1.7	16,100	2.3

Vigo	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wabash	9,000	2.1	9,200	2.4	11,700	2.5	13,200	2.7
Warren	3,200	0.7	2,800	0.7	3,000	0.6	2,900	0.5
Wells	6,300	1.5	6,000	1.5	7,500	1.6	8,300	1.7
White	5,500	1.3	5,700	1.5	6,600	1.4	7,000	1.4
Whitley	5,800	1.4	6,100	1.6	7,700	1.6	8,000	1.6
Totals	254,500		228,600		287,400		308,600	

Employment in Counties of White Basin, State of Indiana

Bartholomew	9,500	1.9	9,400	2.1	13,700	2.3	17,900	2.6
Boone	8,300	1.7	7,400	1.6	9,100	1.5	10,200	1.5
Brown	1,800	0.3	1,600	0.3	1,900	0.3	2,300	0.3
Clay	9,200	1.9	6,500	1.4	8,300	1.4	8,200	1.2
Daviess	8,900	1.8	7,500	1.7	8,900	1.5	8,700	1.2
Decatur	6,200	1.2	5,700	1.2	6,600	1.1	7,200	1.0
Delaware	26,600	5.5	26,300	5.9	35,100	6.1	41,000	6.1
Dubois	7,200	1.4	7,400	1.6	9,100	1.5	9,700	1.4
Gibson	9,800	2.0	8,600	1.9	10,700	1.8	10,400	1.5
Greene	10,500	2.1	8,000	1.8	9,100	1.5	8,800	1.3
Hamilton	8,700	1.8	8,500	1.9	10,900	1.9	15,300	2.2
Hancock	6,400	1.3	6,000	1.3	7,500	1.3	10,200	1.5
Hendricks	7,100	1.4	6,900	1.5	9,200	1.6	15,200	2.2
Henry	13,600	2.8	13,300	3.0	16,500	2.8	18,100	2.6
Jackson	8,600	1.7	8,500	1.9	10,100	1.7	11,400	1.6
Jennings	4,300	0.8	3,900	0.8	4,700	0.8	5,000	0.7
Johnson	7,800	1.6	7,400	1.6	10,000	1.7	16,100	2.3
Knox	15,400	3.1	13,200	3.0	14,800	2.5	14,500	2.1
Lawrence	11,900	2.4	7,400	1.6	11,800	2.0	12,000	1.7
Madison	34,300	7.1	30,100	6.8	42,100	7.3	48,600	7.2
Marion	186,500	38.6	175,300	39.9	234,000	40.7	278,400	41.4
Martin	3,400	0.7	2,600	0.5	3,400	0.5	3,300	0.4
Monroe	12,500	2.5	9,400	2.1	17,400	3.0	22,600	3.3
Morgan	7,100	1.4	6,300	1.4	8,500	1.4	11,700	1.7
Orange	6,100	1.2	5,000	1.1	5,700	0.9	6,300	0.9
Owen	4,000	0.8	3,300	0.7	4,000	0.6	3,700	0.5
Pike	5,300	1.0	4,100	0.9	4,500	0.7	4,100	0.6
Putnam	8,400	1.7	6,300	1.4	7,600	1.3	8,500	1.2
Randolph	8,800	1.8	9,300	2.1	10,300	1.7	10,700	1.5
Rush	6,800	1.4	6,300	1.4	7,200	1.2	7,500	1.1
Scott	2,400	0.4	3,100	0.7	3,700	0.6	4,600	0.6
Shelby	9,700	2.0	8,900	2.0	11,300	1.9	13,100	1.9
Washington	5,600	1.1	5,100	1.1	5,900	1.0	6,200	0.9
Totals	482,700		438,600		573,600		671,500	

Table 6 Value of Farm Products Produced and Sold In Counties Situated in the Wabash and White River Basins as Reported by Censuses of Agriculture for 1949, 1954 and 1958

	1949 [a] $(000)	1954 $(000)	1959 $(000)
Counties of Wabash Basin in the State of Illinois			
Champaign	32,201	37,221	36,431
Clark	8,401	9,167	11,941
Clay	4,578	4,685	7,882
Coles	13,621	12,544	15,194
Crawford	6,496	6,023	8,394
Cumberland	5,333	5,698	9,602
Douglas	13,345	14,738	14,049
Edgar	17,792	19,243	19,588
Edwards	3,719	4,665	4,503
Effingham	6,923	6,629	10,587
Hamilton	3,219	3,941	5,335
Jasper	7,351	7,733	11,425
Lawrence	4,190	4,758	5,731
Richland	3,847	4,697	6,633
Vermilion	25,334	30,930	28,802
Wabash	3,267	4,260	4,733
Wayne	6,368	8,104	11,696
White	6,171	7,656	8,997
	$ 172,156	$ 192,692	$ 221,523
Counties of Wabash Basin in State of Indiana			
Benton	13,425	16,540	15,621
Blackford	3,540	4,614	3,907
Carroll	11,811	15,885	16,487
Cass	11,049	14,457	15,004
Clinton	14,035	17,784	17,201
Fountain	8,106	10,762	10,044
Fulton	8,628	11,428	11,918
Grant	10,991	13,869	13,480
Howard	9,866	12,771	12,854
Huntington	9,521	12,770	11,649
Jay	7,047	9,511	7,650
Koscinsko	15,310	18,966	19,862
Miami	9,338	12,739	13,593
Montgomery	14,168	17,602	17,369
Parke	7,739	9,541	9,013
Pulaski	8,974	12,619	11,818
Sullivan	6,496	7,057	8,747

Table 6 (Cont'd)

	1949 a/ $(000)	1954 $(000)	1959 $(000)
Tippecance	13,660	15,999	16,362
Tipton	9,081	10,964	10,598
Vermillion	5,456	5,955	6,022
Vigo	6,656	9,577	8,214
Wabash	11,491	14,545	15,665
Warren	8,161	10,193	10,228
Wells	9,261	12,427	11,591
White	13,643	17,677	17,498
Whitley	8,087	9,464	9,201
	$ 255,540	$ 325,716	$ 321,596
Counties of White Basin, State of Indiana			
Bartholomew	8,005	7,788	8,977
Boone	13,321	16,506	15,059
Brown	749	791	991
Clay	5,077	7,004	7,963
Daviess	7,914	9,304	12,745
Decatur	9,891	11,342	13,499
Delaware	10,037	11,877	10,269
Dubois	6,337	8,692	11,901
Gibson	8,338	10,583	11,935
Greene	5,896	6,619	8,035
Hamilton	11,605	13,900	12,957
Hancock	7,773	9,389	10,192
Hendricks	12,238	14,812	13,572
Henry	10,271	12,838	13,244
Jackson	6,079	7,530	9,615
Jennings	3,151	3,920	4,037
Johnson	8,753	9,712	10,552
Knox	11,999	13,991	15,626
Lawrence	3,310	3,636	5,280
Madison	11,973	13,929	14,194
Marion	8,740	8,273	7,884
Martin	1,453	1,974	2,608
Monroe	2,196	2,333	3,456
Morgan	6,457	8,286	7,914
Orange	3,536	4,140	4,380
Owen	2,790	3,604	4,212
Pike	3,185	3,525	4,783
Putnam	9,602	10,820	12,460

Table 6 (Cont'd)

	1949 [a] $(000)	1954 $(000)	1959 $(000)
Randolph	11,312	14,074	12,747
Rush	13,698	16,377	15,055
Scott	1,847	2,399	2,788
Shelby	10,298	12,171	13,535
Washington	7,358	9,596	11,327
	$ 245,189	$ 291,735	$ 313,792

[a] For some counties data were reported for 1950

Table 7. Manufacturing and Retailing Activities by Counties in the Wabash and White River Basins as Reported by Business Censuses for 1954 and 1958

	Value Added, Mfg. 1954	Value Added, Mfg. 1958	Total Retail Sales 1954	Total Retail Sales 1958
Economic Contributions of Counties in the State of Illinois				
Champaign	15,443,000	24,443,000	121,172,000	142,431,000
Clark	5,434,000	N/a	17,075,000	17,386,000
Clay	2,463,000	3,670,000	14,748,000	17,918,000
Coles	18,854,000	29,314,000	46,639,000	55,832,000
Crawford	22,240,000	31,885,000	19,326,000	22,187,000
Cumberland	1,727,000	1,309,000	6,602,000	7,272,000
Douglas	6,408,000	N/a	19,877,000	25,858,000
Edgar	7,246,000	6,382,000	23,539,000	23,948,000
Edwards	1,935,000	964,000	7,273,000	6,311,000
Effingham	6,794,000	8,009,000	25,483,000	35,595,000
Hamilton	901,000	1,133,000	7,621,000	8,246,000
Jasper	276,000	1,429,000	7,241,000	9,358,000
Lawrence	N/a	N/a	16,979,000	16,634,000
Richland	3,287,000	2,040,000	17,211,000	18,660,000
Vermilion	73,468,000	94,100,000	101,620,000	115,768,000
Wabash	3,419,000	8,530,000	15,518,000	15,702,000
Wayne	N/a	N/a	16,412,000	18,219,000
White	1,908,000	1,879,000	21,740,000	22,224,000
	$171,803,000	$215,087,000	$506,076,000	$579,549,000
Economic Contributions of Counties in the State of Indiana				
Benton	663,000	1,892,000	13,288,000	14,693,000
Blackford	8,860,000	14,648,000	14,090,000	15,757,000
Carroll	4,261,000	4,881,000	17,006,000	19,202,000
Cass	21,186,000	20,596,000	42,094,000	48,358,000
Clinton	12,288,000	14,291,000	31,462,000	33,743,000
Fountain	4,880,000	11,278,000	19,294,000	21,397,000
Fulton	5,719,000	7,530,000	17,873,000	17,569,000
Grant	70,316,000	110,041,000	64,814,000	79,166,000
Howard	92,110,000	109,181,000	64,538,000	69,969,000

Table 7 (Cont'd)

	Value Added, Mfg. 1954	Value Added, Mfg. 1958	Total Retail Sales 1954	Total Retail Sales 1958
Huntington	22,373,000	24,468,000	33,262,000	34,640,000
Jay	17,245,000	20,027,000	20,900,000	19,904,000
Koscinsko	22,878,000	30,802,000	42,213,000	54,792,000
Miami	14,271,000	16,618,000	29,591,000	37,322,000
Montgomery	19,085,000	26,319,000	36,351,000	37,080,000
Parke	2,349,000	1,379,000	11,056,000	11,850,000
Pulaski	1,387,000	1,378,000	13,993,000	15,100,000
Sullivan	622,000	2,206,000	16,034,000	17,726,000
Tippecanoe	67,303,000	83,709,000	83,739,000	103,630,000
Tipton	6,436,000	5,379,000	11,507,000	12,285,000
Vermillion	15,276,000	2,840,000	16,144,000	16,952,000
Vigo	75,688,000	93,843,000	119,686,000	137,263,000
Wabash	31,531,000	36,388,000	31,403,000	36,735,000
Warren	34,000	N/a	4,065,000	3,718,000
Wells	7,809,000	11,389,000	21,647,000	20,817,000
White	4,704,000	5,813,000	21,582,000	25,707,000
Whitley	9,916,000	17,395,000	18,789,000	20,308,000
	$539,190,000	$674,291,000	$816,421,000	$925,683,000
Economic Contributions, Counties, White Basin, State of Indiana				
Bartholomew	68,110,000	96,669,000	42,157,000	55,496,000
Boone	11,093,000	16,866,000	24,662,000	31,838,000
Brown	N/a	46,000	2,408,000	3,034,000
Clay	7,240,000	8,673,000	20,332,000	21,814,000
Daviess	5,343,000	6,422,000	21,147,000	23,646,000
Decatur	3,389,000	6,171,000	20,700,000	24,401,000
Delaware	149,534,000	154,829,000	106,146,000	115,790,000
Dubois	15,709,000	22,356,000	26,545,000	28,825,000
Gibson	10,860,000	10,196,000	27,998,000	30,643,000
Greene	4,221,000	7,522,000	22,908,000	25,003,000
Hamilton	15,964,000	17,930,000	26,688,000	30,327,000
Hancock	3,825,000	4,483,000	22,085,000	26,999,000
Hendricks	721,000	1,484,000	22,549,000	28,323,000
Henry	32,558,000	33,095,000	46,859,000	52,103,000
Jackson	18,699,000	24,273,000	28,683,000	29,985,000
Jennings	2,390,000	4,930,000	10,922,000	12,884,000
Johnson	14,835,000	15,294,000	29,005,000	35,853,000
Knot	13,402,000	20,870,000	42,383,000	47,946,000
Lawrence	28,780,000	22,923,000	33,178,000	34,529,000

Table 7 (Cont'd)

	Value Added, Mfg. 1954	Value Added, Mfg. 1958	Total Retail Sales 1954	Total Retail Sales 1958
Madison	206,088,000	214,061,000	121,266,000	134,934,000
Marion	844,783,000	955,259,000	826,931,000	943,202,000
Martin	1,015,000	13,272,000	7,692,000	9,147,000
Monroe	51,700,000	60,794,000	47,655,000	55,899,000
Morgan	4,803,000	3,854,000	22,870,000	26,517,000
Orange	8,060,000	7,995,000	12,843,000	13,759,000
Owen	899,000	1,298,000	7,667,000	8,256,000
Pike	210,000	316,000	10,175,000	9,806,000
Putnam	6,528,000	14,789,000	22,537,000	24,161,000
Randolph	21,974,000	28,897,000	27,596,000	28,658,000
Rush	8,161,000	8,678,000	19,897,000	22,198,000
Scott	7,279,000	N/a	11,260,000	12,682,000
Shelley	11,491,000	27,656,000	30,198,000	36,467,000
Washington	7,011,000	4,262,000	13,227,000	12,868,000
	$1,586,675,000	1,816,163,000	$1,759,169,000	$1,997,993,000

SECTION II - ESTIMATES OF DAMAGES AND BENEFITS

1. GENERAL.

Data used in estimates of flood damages and benefits as presented in this report are based on field surveys conducted after several recent floods and economic studies made for this and other previous reports. Data have been adjusted to reflect changes in economic development and conditions and the effects of local protection projects completed or expected to be complete in the near future. For study purposes, the areas along the various streams considered in this analysis have been divided into reaches and all damages within each area related to a control gage for the reach. Flood damages for each reach and for the various categories of flood losses are studied separately. A description of the derivation of these damages by various types of development are presented in following paragraphs. To avoid duplication of work sample table 2 and plates B-1 through B-5 are taken from Interim Report, Review of Wabash River Basin, March 1963, Appendix B.

2. FLOOD DAMAGES.

a. Wabash River Basin.

(1) Agricultural areas.

(a) General. Damage estimates of crop and non-crop agricultural properties are the result of an accumulation of data gathered over an extended period by field surveys in farming areas and through interviews with county agricultural agents, Soil Conservation Service personnel and agricultural departments of universities. Publications and current digests of agricultural prices, farming practices and farm economics were also consulted in value and damage developments. Methods and general procedures used in development of agricultural damages are given herein.

(b) Crop damages. Development of flood damages to crops involves the use of stage-area inundated data; flood profiles; crop values and distribution data; unit damage tables; and floods of the record period. Stage-area inundated curves were developed by use of flood plain charts and/or topographic maps on which have been placed the limits of several actual or synthetic flood lines throughout the range of flooding. The areas within each of the flow lines were determined and related to the comparable stages at the control gage. Stage-area inundated curves were developed for the unprotected area in each reach and for areas behind each individual effective levee. A sample area curve is presented on plate 1 for Reach W-4, Wabash River. Crop distrubution and crop values were developed primarily by systematic strip sampling of agricultural areas and by use of current publications of prices received by farmers for the various

crops. The samples comprised between fifteen and twenty-five percent of the total area in each reach, dependent upon the average farm size and the general use of the area. Woods and wasteland were derived by map measurement. Table 1 presents sample data pertinent to land use, yields and unit crop values for selected reaches within the study area.

TABLE 1

LAND USE AND CROP VALUES
SELECTED STREAM REACHES BELOW STUDIED DAM SITES

Crop	Land use percent of total	Average yield in flood-free years	Unit value (1963)	Value per acre (1963)
Embarrass River - Reach EM-2				
Corn	45.1	79 bu	$ 1.02	$81
Soybeans	36.4	32 bu	2.69	86
Wheat	8.6	34 bu	2.02	69
Hay	1.6	2.1 tons	25.80	54
Oats	3.5	49 bu	0.63	31
Pasture	0.5	-	-	40
Unproductive	4.3	-	-	-
East Fork White River - Reach EW-4				
Corn	52.4	84 bu	$ 0.95	$80
Soybeans	21.3	31 bu	2.70	84
Wheat	10.0	34 bu	1.98	67
Hay	2.3	2.8 tons	23.80	67
Pasture	4.8	-	-	40
Unproductive	9.2	-	-	-
Patoka River - Reach P-3				
Corn	29.7	83 bu	$ 0.95	$79
Soybeans	34.1	31 bu	2.70	84
Wheat	2.8	36 bu	1.98	71
Hay	4.4	2.1 tons	23.80	50
Pasture	4.5	-	-	40
Unproductive	24.5	-	-	-

Unit crop damages were developed by weighing the various factors included in crop production and the effect of flooding on each crop. Several basic factors used in the evaluation are: cost of the separate items of production; time sequence; stage of crop development at various times of the year; reduction in yields resulting from late planting; and the cost and net profit from alternate crops. From these and other factors related to crop damages, unit damage tables were compiled which express damages in percent of crop value, for flooding at various times of the year. (A sample of these unit crop damages for Reach W-4, Wabash River, is given in table 2.) Using the floods through the period of record, damages for each flood for each crop were computed by applying the applicable damage factor for the time of year and the duration and depth of flooding. When more than one flood occurred during a growing season, adjustments were made to eliminate any duplication of flood damages. A summation of these damages for each crop gives the total flood damage through the record period. The average crop damage per acre is obtained by dividing the sum of damages by the sum of the areas inundated for each crop through the period of record. Applying these average damages per acre to stage-area inundated data gives the average crop damage for stage through the range of flooding, and forms the basis of the crop damage curve. Demonstrations of the development of the average damages per acre and average damage for stage are presented on plates B-2 and B-3, respectively, for Reach W-4, Wabash River.

(c) Non-crop damages. The basis of non-crop agricultural losses are data compiled from economic studies and flood damage surveys adjusted to reflect current values. From these data, separate damage curves were prepared for the various items of damageable property as erosion, sanding, fencing, debris removal, etc. These individual curves were composited to obtain the total non-crop damage for stage. Plate B-4 illustrates the individual and composite non-crop damage curves.

TABLE 2
SAMPLE-UNIT CROP DAMAGES
REACH W-4 WABASH RIVER

Crop Damages as percentage of total crop value-per acre												
Crop	Corn		Soybeans		Wheat		Hay		Pasture		Oats	
Depth-feet	0-2	Over 2	0-2	Over 2	0-2	Over 2	0-2	Over 2	0-2	Over 2	0-2	Over 2
Duration-hours	0-48	48+	0-48	48+	0-48	48+	0-48	48+	0-48	48+	0-48	48+
Time of Flood												
1 Jan - 29 Feb	0.7	0.7	0.1	0.1	5.0	5.0	2.6	10.0	0.0	0.0	1.0	1.0
1 -31 Mar	0.7	0.7	0.1	0.1	9.2	12.2	3.0	10.0	0.0	0.0	3.0	3.0
1-15 Apr	1.3	1.8	0.9	0.9	25.0	30.8	4.4	11.7	10.5	16.5	20.8	30.7
16-30 Apr	2.0	3.0	2.0	2.3	37.0	43.8	5.9	14.5	27.1	42.7	31.6	55.8
1-15 May	6.8	8.3	9.0	11.1	51.0	57.8	8.8	19.9	31.0	48.0	39.3	56.3
16-31 May	20.5	23.0	15.8	21.3	62.0	70.0	14.6	32.5	28.4	43.8	27.0	36.0
1-15 Jun	41.0	50.0	30.5	42.5	62.0	70.0	25.5	68.7	25.5	39.2	27.0	36.8
16-30 Jun	64.0	78.0	51.8	75.3	28.0	42.0	25.0	71.8	23.1	35.0	61.4	81.0
1-15 Jul	38.5	84.8	66.1	86.5	5.0	8.5	18.3	68.5	21.0	32.0	37.5	40.9
16-31 Jul	26.5	86.6	67.3	86.5	0.0	0.0	13.5	61.4	19.0	29.0	7.8	7.8
1-15 Aug	18.0	86.6	67.3	86.5	0.1	0.1	9.3	49.3	17.2	27.1	1.0	1.0
16-31 Aug	21.8	86.6	67.3	86.5	3.0	3.0	6.9	35.5	15.6	25.4	1.0	1.0
1-15 Sep	8.2	85.6	66.1	86.5	8.0	8.0	5.0	22.1	13.6	22.8	1.0	1.0
16-30 Sep	5.9	81.6	58.2	76.1	16.0	16.5	3.9	15.5	11.2	19.6	1.0	1.0
1-15 Oct	4.2	73.0	37.3	51.9	28.0	33.4	2.9	12.3	8.8	15.4	1.0	1.0
16-31 Oct	2.8	51.0	14.6	21.9	45.0	55.0	2.8	10.4	5.4	10.0	1.0	1.0
1-15 Nov	1.8	26.5	3.8	7.0	21.0	28.5	2.2	10.0	1.4	2.7	1.0	1.0
16-30 Nov	1.2	14.0	0.1	0.9	11.4	16.5	2.0	10.0	0.0	0.0	1.0	1.0
1-15 Dec	0.7	6.0	0.0	0.0	6.3	9.8	2.0	10.0	0.0	0.0	1.0	1.0
16-31 Dec	0.7	2.0	0.0	0.0	5.0	7.5	2.0	10.0	0.0	0.0	1.0	1.0

NOTE: Maximum damage is total value of crop minus labor and expenses non-expended at time of flood.

(2) Urban damages. Damage surveys have been made of each urban area within the study area. Data from these surveys were supplemented by economic studies of individual urban areas and adjustments were made, where necessary, to reflect 1963 values and conditions. Estimated flood damages by stream reaches to these urban areas for recurrence in 1963 of the March 1913 and June 1960 floods are presented in tables 3 and 4, respectively. An individual stage damage curve was drawn for each urban area affected and the damage for stage composited into the reach damage curve.

(3) Transportation route damage. Flood damages to transportation routes are based primarily on detailed studies made after the 1943 flood. The data have been supplemented by recent damage surveys in which state and county road officials were consulted for flood damage information. All damage information presented in this report has been adjusted to represent 1963 values and conditions. The transportation route damages for recurrence at present of the March 1913 and June 1960 floods are presented as parts of tables 3 and 4, respectively.

(4) Levee damage. Damage to agricultural levees varies considerable, dependent upon river stages and velocities and the grade and condition of the levee. Many private levees are poorly maintained and have inadequate slopes. During floods, these levees suffer erosion and often lengthy sections are washed out when the levees are overtopped. Levee damage estimates have been developed from actual contract repair costs as modified to reflect present day values and conditions. The estimated levee damages for recurrence of the March 1913 and June 1960 floods are given in tables 3 and 4, respectively.

(5) Damage curves. Using the data described in previous paragraphs, separate stage-damage curves were constructed by stream reaches for all major types of damageable properties in the overflow areas. Examples of these for Reach W-4, Wabash River, are presented on plates B-5a through B-5c. To simplify presentation and computation of average annual damages, all damages within each reach were composited into one curve which represents the actual damage for stage, including damages that would occur to the protected areas above the effective heights of the levees. These damage curves for each reach studied are presented on plates B-6a through B-6r.

TABLE 3

ESTIMATED DAMAGE FOR RECURRENCE OF THE MARCH 1913 FLOOD

Stream and reach	Damage for flood recurrence (1963)				
	Agricultural		Transportation		Levee or other ($1,000)
	Crop ($1,000)	Non-crop ($1,000)	routes ($1,000)	Urban ($1,000)	
Wabash River					
W-1 Mi. 0.0-40.0	130	1,072	129	65	-
W-2 Mi. 40.0-94.5	155	2,005	1,152	342(1)	102
W-3 Mi. 94.5-124.2	183	770	766	-	11
Total Wabash River	468	3,847	2,047	407	113
Embarrass River					
EM-1 Mi. 0.0-63.8	176	259	268	152	160
EM-2 Mi. 63.8-103.2	42	220	67	-	-
Total Embarrass River	218	479	335	152	160
White River					
WH-1 Mi. 0.0-51.6	71	200	32	139	-
East Fork White River					
EW-1 Mi. 51.6-111.9	91	352	135	88	-
EW-2 Mi. 111.9-146.2	28	143	16	-	-
EW-3 Mi. 146.2-183.7	49	128	110	-	-
EW-4 Mi. 183.7-238.3	256	622	269	824	-
Total East Fork White River	424	1,245	530	912	-
Clifty Creek					
CC-1 Mi. 0.0-18.4	10	50	37	354	-
Patoka River					
P-1 Mi. 0.0-17.5	27	11	-	-	7
P-2 Mi. 17.5-34.6	45	19	21	14	239
P-3 Mi. 34.6-54.8	28	12	-	14	26
P-4 Mi. 54.8-62.2	9	7	6	-	10
P-5 Mi. 62.2-81.1	26	21	74	-	16
P-6 Mi. 81.1-106.0	25	20	60	480	8
P-7 Mi. 106.0-118.3	8	7	3	19	6
Total Patoka River	168	97	164	527	312
Grand total Wabash River and tributaries	1,359	5,918	3,145	2,491	585

(1) Excludes Mt. Carmel, Ill.(local protection anticipated in near future).

TABLE 4

ESTIMATED DAMAGE FOR RECURRENCE OF THE JUNE 1960 FLOOD

Stream and reach	Damage for flood recurrence (1963)				
	Agricultural		Transportation		Levee or
	Crop ($1,000)	Non-crop ($1,000)	routes ($1,000)	Urban ($1,000)	other ($1,000)
Wabash River					
W-1 Mi. 0.0-40.0	1,598	75	-	-	-
W-2 Mi. 40.0-94.5	1,548	114	-	(1)	-
W-3 Mi. 94.5-124.2	310	11	-	-	-
Total Wabash River	3,456	200	-	-	-
Embarrass River					
EM-1 Mi. 0.0-63.8	691	52	41	14	12
EM-2 Mi. 63.8-103.2	372	103	-	-	-
Total Embarrass River	1,063	155	41	14	12
White River					
WH-1 Mi.0.0-51.6	865	60	-	-	-
East Fork White River					
EW-1 Mi. 51.6-111.9	836	54	14	-	-
EW-2 Mi. 111.9-146.2	230	24	2	-	-
EW-3 Mi. 146.2-183.7	496	51	55	-	-
EW-4 Mi. 183.7-238.3	1,980	170	14	-	-
Total East Fork White River	3,542	299	85	-	-
Clifty Creek					
CC-1 Mi. 0.0-18.4	11	-	-	-	-
Patoka River					
P-1 Mi. 0.0-17.5	210	7	-	-	-
P-2 Mi. 17.5-34.6	162	5	1	-	9
P-3 Mi. 34.6-54.8	159	5	-	-	15
P-4 Mi. 54.8-62.2	7	1	-	-	2
P-5 Mi. 62.2-81.1	90	7	1	-	3
P-6 Mi. 81.1-106.0	87	6	-	16	1
P-7 Mi. 106.0-118.3	35	2	-	-	-
Total Patoka River	758	33	2	16	30
Grand total Wabash River and tributaries	9,695	747	128	30	42

(1) Excludes Mt. Carmel, Ill. (local protection anticipated in near future)

b. Ohio River. Flood damages in areas along the Ohio River below the Wabash River were developed from previously compiled flood damage data obtained during prior surveys and adjusted to reflect current values and conditions of development. Generally, methods and procedures used in developing Wabash River data were also applied to Ohio River areas. Presented in table 5 is a summary of damages expected for recurrence of stages equivalent to the maximum flood of record that occurred in January 1937 and for the March 1945 occurrence.

TABLE 5

FLOOD DAMAGES - OHIO RIVER BELOW THE WABASH RIVER

Reach	Mile to mile	Damage for flood recurrence (1) 1937 Stage	1945 Stage
O-1	981.0-920.4	$ 7,600,000	$ 1,030,000
O-2	920.4-848.0	10,570,000	1,960,000
Total		$ 18,170,000	$ 2,990,000

(1) 1963 values based on 1961 development

The above estimates exclude flood damages prevented by Federally constructed protection works at Shawneetown, Rosiclaire, Golconda, Brookport, Mounds and Mound City, Illinois and Paducah, Kentucky. Flood damage curves for each of these Ohio River reaches were developed from data presented in table 5 and similar data for other flood stages.

c. Average annual damages. Average annual damages were developed by use of the standard method of developing annual flood losses. Average annual damages are obtained from damage-frequency curves on which flood damages are plotted against flood exceedence frequencies. The area under these curves, obtained by planimetering, represents the average annual flood loss when converted to dollar values. Natural flood exceedence frequencies at stream gaging stations influenced by operation of existing reservoirs and those reservoirs under construction were initially modified to reflect reductions afforded by operation of these reservoirs. Average annual flood damages, representing 1963 conditions of development, values, and flow conditions in stream reaches along the Wabash River and tributaries studied for this report, are estimated to be $7,443,000. Average annual damages along the Ohio River below the Wabash River are estimated to be $854,000.

A detailed breakdown of average annual flood damages for areas below the studied reservoir sites is presented in table 6.

d. Presentation of data. Average annual flood damages and flood control benefits for stream reaches along the Ohio River, Wabash River and tributaries within the study area were computed by use of the damage-frequency method of obtaining annual flood losses. As this method requires presentation of large amounts of detailed data, the actual and modified computations have been transferred to graphic presentation on frequency-damage curves. These curves for the Wabash River and tributaries are presented on plates B-7a through B-7v. The Ohio River curves are not presented because the relatively small amount of benefits can be illustrated only on a large scale graph. Computed data for all streams and reaches concerned are available in the office of the U. S. Army Engineer District, Louisville, Kentucky.

TABLE 6

ESTIMATED AVERAGE ANNUAL DAMAGES BY STREAM REACHES

Stream and reach	Mile to mile	Average annual damage (1)
Wabash River		
W-1	0.0-40.0	$ 676,000
W-2	40.0-94.5	583,000
W-3	94.5-124.2	496,000
Total Wabash River		$ 1,755,000
Embarrass River		
EM-1	0.0-63.8	$ 938,000
EM-2	63.8-103.2	358,000
Total Embarrass River		$ 1,296,000
White River		
WH-1	0.0-51.6	$ 315,000
East Fork White River		
EW-1	51.6-111.9	$ 206,000
EW-2	111.9-146.2	66,000
EW-3	146.2-183.7	455,000
EW-4	183.7-238.3	1,715,000
Total East Fork White River		$ 2,442,000
Clifty Creek		
CC-1	0.0-18.4	$ 37,000
Patoka River		
P-1	0.0-17.5	$ 158,000
P-2	17.5-34.6	479,000
P-3	34.6-54.8	371,000
P-4	54.8-62.2	57,000
P-5	62.2-81.1	255,000
P-6	81.1-106.0	233,000
P-7	106.0-118.3	45,000
Total Patoka River		$ 1,598,000
Total Wabash River and tributaries		$ 7,443,000
Ohio River		
O-1	981.0-920.4	$ 159,000
O-2	920.4-848.0	695,000
Total Ohio River		$ 854,000

(1) 1963 values. Damages are residual to reservoir and levee projects, existing, under construction, or in advanced planning stage.

3. FUTURE GROWTH IN POPULATION, LABOR FORCE AND EMPLOYMENT

a. General. The Wabash Basin has a significant share in the population growth projected for the United States and for the Ohio River Basin. Based on preliminary data from the A. D. Little study, the Ohio River Basin population, of which the Wabash population is a part, is projected to increase in rounded numbers from 19.0 million in 1960 to about 31.7 million in 2010, an increase on this basis of 67 percent. A like increase for the next 50 years will project the population of the Ohio River Basin at 52.9 million for the year 2060.

The Wabash Basin, including the White Basin, had a population of 3.1 million in 1960, projected to 5.5 million in 2010, an increase of 77 percent. A like increase for the next 50 years will project the population of the total Wabash Basin at 9.7 million for the year 2060.

b. Population, labor force, and employment growth.

(1) Lincoln Reservoir. The 5 counties that would receive direct benefits from this project have been determined to be: Coles, Crawford, Cumberland, Jasper, and Lawrence, all in Illinois. The population for those 5 counties was 103,400 in 1960, and this has been projected to increase to 175,000 in 2010. If a similar rate of growth is projected for the next 50 years, this group of counties will have attained a population of 297,000 in 2060, an increase in 100 years of 188 percent. During the same period of time the labor force will have increased from 39,000 to 115,000, a growth of 195 percent. Total employment in this 5-county group is projected to increase from 36,700 in 1960, to 112,000 in 2060, a growth of 205 percent.

(2) Clifty Creek Reservoir. The 6 counties that would receive direct benefits from this project have been determined to be: Bartholomew, Jackson, Lawrence, Martin, Daviess, and Knox, all in Indiana. The total population for those 6 counties was 194,200 in 1960, and this has been projected to increase to 590,000 by the year 2060, an increase of 204 percent. During the same period of time the labor force will have increased from 72,100 to 228,000, or an increase of 229 percent. Total employment in this 6-county group is projected to increase from 67,800 to 223,000 in 2060, a growth of 229 percent.

(3) Patoka Reservoir. The 3 Indiana counties that would receive direct benefits from this project have been determined to be: Dubois, Gibson, and Pike. Total population for those 3 counties has been projected to increase from 70,200 in 1960, to 193,000 in 2060, an increase in 100 years of 175 percent. During the same period of time the labor force will have increased from 25,100 to 77,000, or an increase of 207 percent. Total employment in this 3-county group is projected to increase from 24,200 to 70,000, or an increase of 189 percent.

(4) Growth in a larger benefit area. In addition to the 14 counties situated so as to benefit directly from the three proposed reservoirs, are 13 downstream counties that would benefit from the projects. These counties are located in Illinois, Indiana and Kentucky.

Inasmuch as the downstream counties are projected to experience lower rates of growth, their statistical data have a conservative effect upon the total projections. In this total of 27 counties, population has been projected to increase from 558,500 in 1960, to 816,160 in 2010. If a similar rate of growth is projected for the next 50 years, this 27-county area will have attained a population of 1,277,000 in 2060, an increase in 100 years of 129 percent. During the same period of time the labor force will have increased from 203,100 to 498,060, or an increase of 145 percent. Total employment for this area is projected to increase from 190,700 in 1960, to 484,000 in 2060, or an increase of 154 percent.

The projected growth of employment at a higher percent with respect to population growth (154% as compared to 129%) is significant. This indicates a faster rate of growth for economic activities which can provide employment, and this will have a multiplier effect upon the area's total economy. It is considered that these data will support the conservative estimate that a 200 percent growth in the overflow areas of the Basin and a 150 percent growth in the lower Ohio River overflow area would occur during the 100-year project life period, without development of the subject flood control projects.

4. BENEFITS.

a. General. Flood damages prevented by operation of Lincoln, Clifty Creek and Patoka Reservoirs are measured as the difference in annual flood losses with present conditions of flooding and those expected with the reservoir(s) in operation. This measurement is made by use of the damage-frequency method of computing annual flood losses. Initially, natural flood frequency curves were modified, where applicable, to reflect operation of reservoirs existing, under construction, or in the advanced planning stage. These modified curves are considered to be representative of present flood conditions. These curves were further modified by routing floods from the studied reservoirs to control gages in the downstream areas. Stage reductions from these routings were used to develop modified frequency curves. A tabulation of reductions at selected gaging stations for recurrence of the June 1960 and March 1913 floods with these reservoirs in operation is presented in table 7. Data on the development of actual and modified frequency curves are given in Appendix D, Hydrology and Hydraulics.

TABLE 7

STAGE REDUCTIONS AFFORDED BY RESERVOIRS - SELECTED GAGING STATIONS

Stream and gaging station	June 1960 flood			March 1913 flood		
	Natural stage(1)	Reservoir added		Natural stage(1)	Reservoir added	
		Stage	Reduction		Stage	Reduction
	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)
Lincoln Reservoir						
Embarrass						
Ste. Marie, Ill.	19.0	15.2	3.8	26.0	22.2	3.8
Wabash						
Mt. Carmel, Ill.	20.4	20.1	0.3	30.5	30.4	0.1
Clifty Creek Reservoir						
East Fork White and White						
Seymour, Ind.	17.6	17.3	0.3	23.0	23.0	0.0
Shoals, Ind.	23.6	23.0	0.6	41.2	41.2	0.0
Petersburg, Ind.	22.0	21.94	0.06	28.8	28.74	0.06
Wabash						
Mt. Carmel, Ill.	20.4	20.37	0.03	30.5	30.5	0.0
Patoka Reservoir						
Patoka						
Ellsworth, Ind.	13.0	1.0	12.0	19.2	1.0	18.2
Jasper, Ind.	9.3	6.4	2.9	15.9	12.2	3.7
Winslow, Ind.	21.6	21.2	0.4	28.4	26.8	1.6
Princeton, Ind.	10.1	10.07	0.03	23.5	21.9	1.6
Wabash						
Mt. Carmel, Ill.	20.4	20.38	0.02	30.5	30.45	0.05

(1) Natural stages at Mt. Carmel, Petersburg and Shoals have been modified to reflect operation of reservoirs existing and under construction (1963). Actual stages were: Mt. Carmel-1913 = 31.0, 1960 = 21.2; Petersburg-1913 = 29.2, 1960 = 22.5; Shoals-1913 = 42.2, 1960 = 25.1

b. Flood control. Flood control benefits creditable to operation of Lincoln, Clifty Creek and Patoka Reservoirs are the reductions in flood stages and flood damages in overflow areas along streams below the respective dam sites. These benefits will accrue to portions of areas along seven streams, the Wabash, Embarrass, White, East Fork White, Patoka and Ohio Rivers and Clifty Creek, from operation of the studied reservoirs. Flood control benefits from operation of each of these reservoirs are summarized by stream reaches in table 8 and presented graphically in plates B-7a through B-7v. Using these benefits as a base, the applicable growth factor was applied to reflect the 200 percent and 150 percent future growth expected to occur in the Wabash Basin and lower Ohio River overflow area, respectively, during the 100-year life of the projects. These future growth benefits are presented as a part of table 11.

TABLE 8

ESTIMATE OF PRESENT FLOOD CONTROL BENEFITS(1)

Stream and reach	Mile to mile	Reservoir		
		Lincoln	Clifty Creek	Patoka
Wabash River				
W-1	0.0-40.0	$ 42,000	$ 8,000	$ 6,000
W-2(2)	40.0-94.5	38,000	8,000	6,000
W-3	94.5-124.2	80,000	-	-
Total Wabash River		160,000	16,000	12,000
Embarrass River				
EM-1	0.0-63.8	666,000	-	-
EM-2	63.8-103.2	358,000	-	-
Total Embarrass River		1,024,000	-	-
White River				
WH-1	0.0-51.6	-	9,000	-
East Fork White River				
EW-1	51.6-111.9	-	29,000	-
EW-2	111.9-142.9	-	10,000	-
EW-3	142.9-183.7	-	55,000	-
EW-4	183.7-238.3	-	202,000	-
Total East Fork White River		-	296,000	-
Clifty Creek				
CC-1	0.0-18.4	-	28,000	-
Patoka River				
P-1	0.0-17.5	-	-	1,000
P-2	17.5-34.6	-	-	36,000
P-3	34.6-54.8	-	-	22,000
P-4	54.8-62.2	-	-	10,000
P-5	62.2-81.1	-	-	22,000
P-6	81.1-106.0	-	-	182,000
P-7	106.0-118.3	-	-	45,000
Total Patoka River		-	-	318,000
Ohio River				
O-1	981.0-920.4	3,000	(3)	(3)
O-2	920.4-848.0	13,000	(3)	(3)
Total Ohio River		16,000	-	-
Total Flood Control Benefits		$1,200,000	$ 349,000	$330,000

(1) 1963 values and conditions of development.
(2) Mt. Carmel, Illinois excluded (construction of local protection anticipated in near future).
(3) Insignificant

c. General recreation. At the request of the District Engineer, the Bureau of Outdoor Recreation made an analysis of the potential visitation at each reservoir site. The results of this report are included in Appendix F as Exhibit F-4. Estimates of attendance, development costs and annual benefits are included in this report. Estimates of benefits for general recreation are computed on the basis of $1.00 per visitor day. Benefits computed for the future increment are discounted to present value, assuming that this growth would be achieved along an accelerated growth curve over the 100-year economic life of the projects. This discount factor at the three percent interest rate is 0.65195. All lands necessary to support the ultimate development would be purchased during the initial development stage. All future costs associated with the ultimate development are discounted to present value by the investment factor of 0.65047, assuming that the ultimate development will follow the accelerated growth. A summary of the estimated annual attendance and benefits is presented in table 9.

TABLE 9

SUMMARY OF GENERAL RECREATION ATTENDANCE AND ANNUAL BENEFITS

Item	Reservoir		
	Lincoln	Clifty Creek	Patoka
Estimated annual attendance			
Initial	425,000	200,000	400,000
Future increment	675,000	600,000	950,000
Total	1,100,000	800,000	1,350,000
Estimated annual benefits			
Initial	$ 425,000	$ 200,000	$ 400,000
Future increment (1)	440,000	391,000	619,000
Total	$ 865,000	$ 591,000	$1,019,000

(1) Discounted to present value (factor = 0.65195).

d. Fish and wildlife recreation. Pursuant to the provisions of the Fish and Wildlife Coordination Act, as amended, and at the request of the District Engineer, the U. S. Fish and Wildlife Service prepared the report included in Appendix F as Exhibit F-3. The report contains discussions of the impact of the reservoir projects on fish and wildlife recreation use of the sites. The benefits are stated as the net increase of fishing and hunting visits to the affected areas. In a further discussion, the report presents recommendations for conservation and development of the fish and wildlife resources at the proposed sites. The recommended proposals are included in the reservoir projects. A summary of the estimated benefits for each of the three reservoirs is presented in table 10.

TABLE 10

SUMMARY OF FISH AND WILDLIFE RECREATION ANNUAL BENEFITS

Reservoir	Increase in annual angler days	Total annual angler benefits	Increase in annual hunter days	Total annual hunter benefits	Total annual F & W benefits
Lincoln	85,000	$94,500	300	$4,500	$ 99,000
Clifty Creek	23,000	26,000	-	-	26,000
Patoka	121,000	130,000	-	-	130,000

e. Water quality control.

(1) General. Benefits credited to storage allocated for water quality control in the proposed reservoir projects were determined as the alternative cost of supplying an equal level of low flow objectives by single purpose reservoirs at or near the proposed reservoir sites. These alternative projects were determined to be feasible, likely to occur in the absence of the proposed multiple purpose projects, and the most economical to be developed for this purpose.

(2) Lincoln Reservoir. The value of storage allocated for water quality control at Lincoln Reservoir was based upon the most economical alternate method of maintaining the low flow objective of 15 cfs at the dam site. While storage of 5,300 acre-feet has been allocated to water quality control and water supply to maintain the combined low flow objective of 25 cfs, a single purpose reservoir with 1,800 acre-feet of storage would maintain

the 15 cfs low flow objective. Therefore, the cost of constructing and operating a single purpose reservoir with 1,800 acre-feet of storage was determined to be the most economical alternative. The average annual equivalent financial charges of this single purpose project were determined to be $44,000 which is the benefits of the storage allocated to water quality control.

(3) Clifty Creek Reservoir. There is no storage allocated to water quality control at the proposed Clifty Creek Reservoir.

(4) Patoka Reservoir. The value of storage allocated to water quality control at Patoka Reservoir was based upon the most economical alternate method of maintaining the low flow objective of 68 cfs at Jasper. It was determined that a single purpose reservoir with 32,000 acre-feet of storage would maintain the low flow objective. The annual financial cost of construction and operation of a single purpose reservoir was estimated at $219,000 which is the benefit of the storage allocated to water quality control.

f. Water Supply.

(1) General. The value of the storage allocated to water supply at the proposed reservoir projects is determined as the cost of the most economical alternative source of water supply in the absence of the proposed projects. The alternative projects studied were deemed feasible and likely to occur in the absence of the proposed projects.

(2) Lincoln Reservoir. The value of the storage allocated to water supply at the proposed Lincoln Reservoir was based upon the construction and operation of a single purpose reservoir with a storage capacity of 800 acre-feet twenty-five years after the completion date of the proposed Lincoln Reservoir. While 5,300 acre-feet has been allocated to meet the total of 25 cfs low-flow objective, of which 10 cfs is for water supply and 15 cfs is for water quality control, a single purpose reservoir would require only 800 acre-feet to meet the 10 cfs objective of water supply. The investment and operation costs of the alternative project have been discounted to present value (factor = 0.4776) and converted into average annual equivalent value by compound interest methods. The present average annual value of this alternate cost is $11,000.

(3) Clifty Creek Reservoir. There is no storage allocated to water supply in the proposed Clifty Creek Reservoir.

(4) Patoka Reservoir. The value of storage allocated to water supply at Patoka Reservoir was based upon the most economical alternate method of maintaining a water supply flow of 130 cubic feet per second at Jasper. It was determined that a single purpose reservoir with 92,000 acre-feet of storage would meet the above flow. The annual financial cost of construction and operation of a single-purpos reservoir was estimated at $344,000, which is the benefit of the storage allocated to water supply.

g. Summary of Benefits. The average annual benefits credited to each reservoir are summarized in table 11.

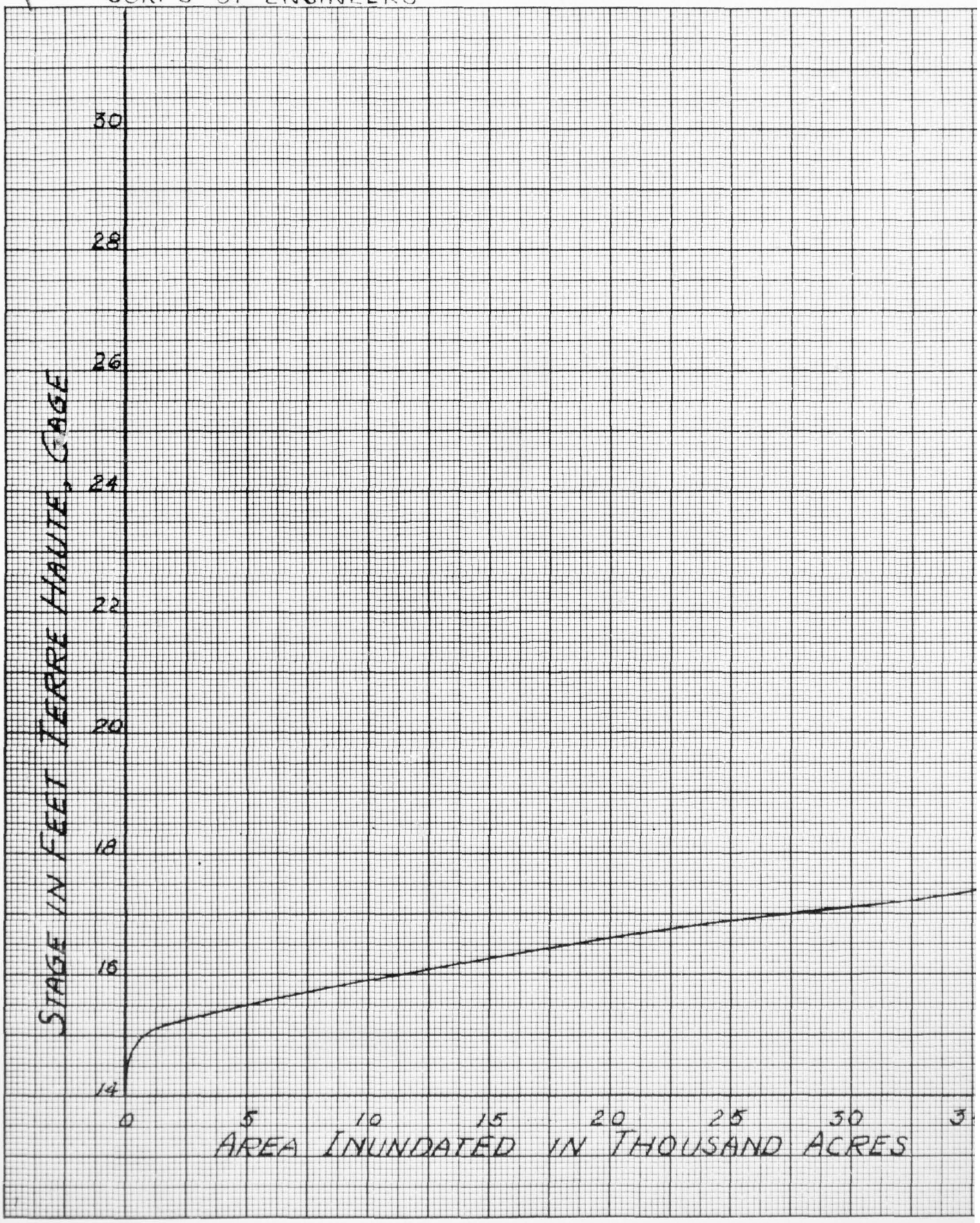
TABLE 11

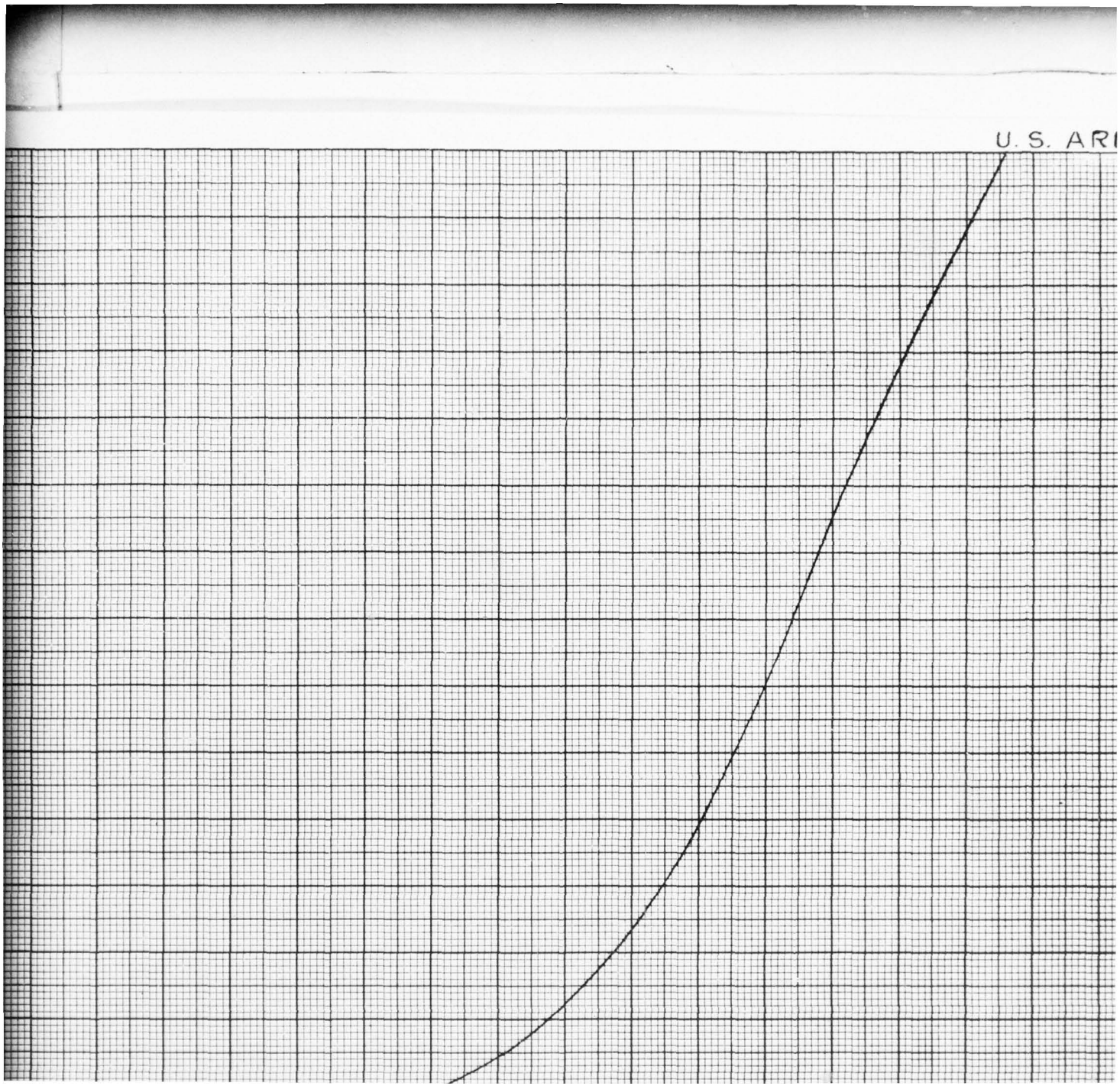
SUMMARY OF ANNUAL BENEFITS
PROPOSED RESERVOIR PROJECTS

Item of benefit	Reservoir benefit ($1,000)		
	Lincoln	Clifty Creek	Patoka
Flood control			
Present	1,200	349	330
Future growth	690	201	190
Total, Flood control	1,890	550	520
Recreation			
General			
Initial	425	200	400
Future increment (1)	440	391	619
Subtotal, General Recreation	865	591	1,019
Fish and Wildlife	99	26	130
Total Recreation	964	617	1,149
Water supply	11	-	344
Water quality control	44	-	219
TOTAL BENEFITS	2,909	1,167	2,232

(1) Discounted to present value.

CORPS OF ENGINEERS

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Sample-Unit Crop Dama

WABASH RIVER
REACH W-4

Crop Damage Computation
Damage in Dollars - Area in

Stage	Date of Flood	Duration (Days)	Total Area Inundated	Depth of Flooding	Corn Value $64 per Acre 1'	Corn Value $64 per Acre 2'	Land 3'
17.3	1952 Mar 18	15	106,000	Area	14,160	19,380	15,900
				% damage	0.7	0.7	0.7
				Damage	6,340	8,680	7,120
16.8	Jun 18	4	95,000	Area	14,160	19,380	13,670
				% damage	66.0	71.0	72.0
				Damage	598,120	880,630	629,910
16.3	1953 Mar 20	7	81,000	Area	19,380	20,870	0
				% damage	0.7	0.7	
				Damage	8,680	9,350	
15.5	1956 Feb 27	4	54,000	Area	26,840	0	0
				% damage	0.7		
				Damage	12,020		
19.7	1957 Apr 12	18	124,000	Area	2,040	2,830	7,850
				% damage	1.4	1.4	1.4
				Damage	1,830	2,540	7,030
23.0	Jun 30	25	134,400	Area	1,290	1,490	1,890
				% damage	54.0	70.0	81.0
				Damage	(2)42,750	(2)64,210	(2)90,950
27.6	1958 Jun 17	23	145,300	Area	990	990	1,490
				% damage	55.0	56.0	60.0
				Damage	34,850	35,480	57,220
24.9	1959 Feb 15	21	139,000	Area	940	1,340	1,290
				% damage	0.7	0.7	0.7
				Damage	420	600	580
20.6	May 3	18	127,500	Area	1,890	2,040	2,830
				% damage	5.2	5.6	5.8
				Damage	6,290	7,310	10,500
18.9	1960 Jun 25	16	120,500	Area	2,830	7,850	14,160
				% damage	65.0	75.0	78.0
				Damage	117,730	376,800	706,870
21.3	1961 Apr 28	20	129,500	Area	1,890	2,040	2,830
				% damage	4.0	4.1	4.2
				Damage	4,840	5,350	7,610
Total for period of record 1905 thru 1961 (3)				Area	699,220	477,920	482,020
				Damage	5,291,060	3,658,530	4,210,980
Average damage per Acre					7.57	8.67	7.65

(1) Sample computations cover period 1952 thru 1961 with several minor floods eliminated.
(2) Damages adjusted to allow for previous flooding in cropping year.
(3) Totals are for total period of record 1905 thru 1961.

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WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES--ETC(U)
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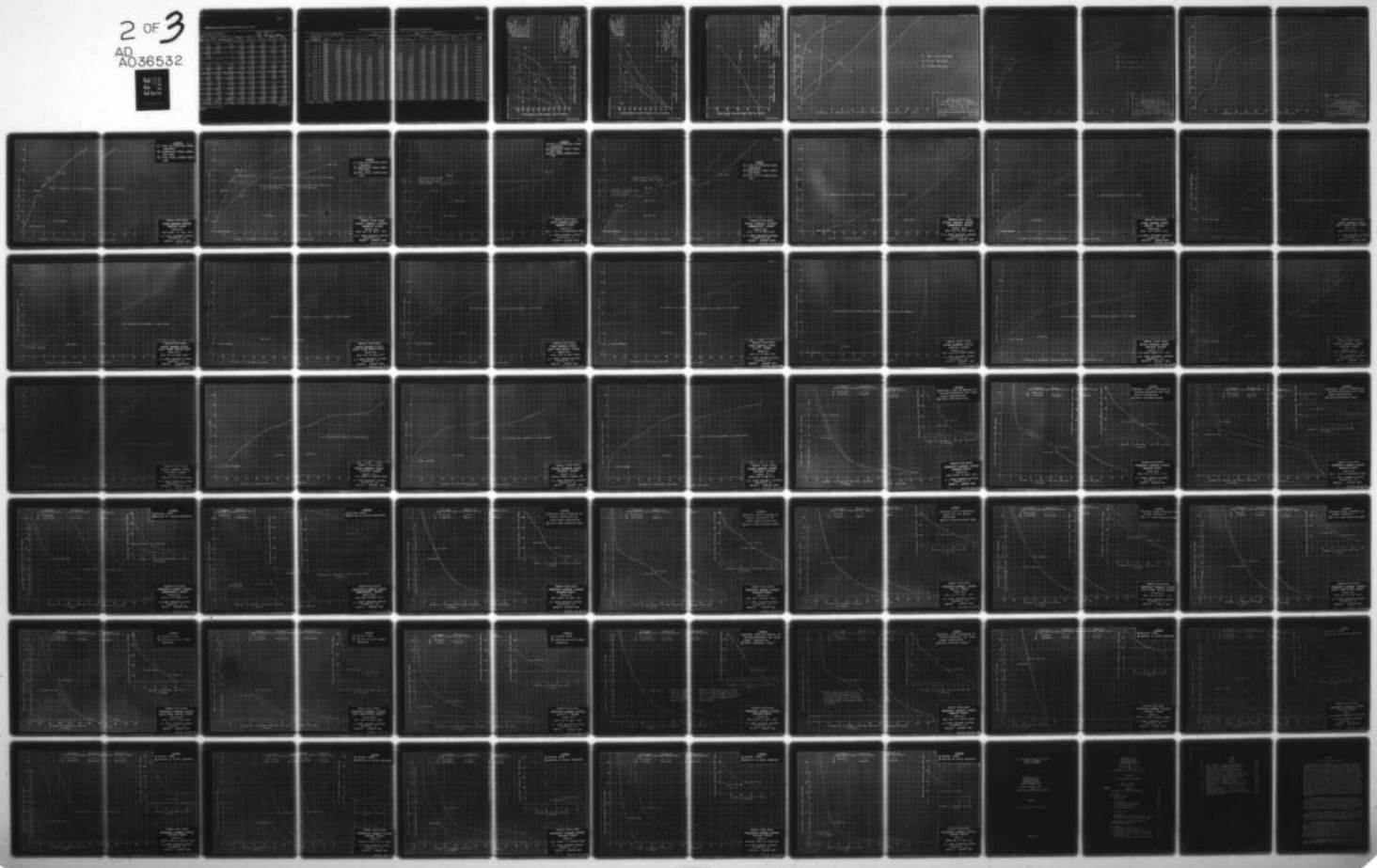

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Sample-Unit Crop Damage per Acre Computations 1952 - 1961 (1)

Crop Damage Computations
Damage in Dollars - Area in Acres

Stream - Wabash River
Reach - W-4
Gage - Terre Haute, Indiana

Corn $64 per Acre, Land Use 49.7% 2'	Corn 3'	Corn Over 3'	Soybeans Val $52 L.U. 14.1%	Wheat Val $39 L.U. 8.8%	Hay Val $46 L.U. 3.0%	Pasture Val $30 L.U. 2.9%	Oats Val $34 L.U. 0.2%
19,380	15,900	3,230	14,950	9,330	3,180	3,070	210
0.7	0.7	0.7	0.4	16.1	10.0	0	7.0
8,680	7,120	1,450	3,110	58,580	14,630	-	500
19,380	13,670	0	13,400	8,360	2,850	2,760	190
71.0	72.0		57.7	58.0	72.0	36.4	81.1
880,630	629,910		402,050	189,100	94,390	30,140	5,240
20,870	0	0	11,420	7,130	2,430	2,350	160
0.7			0.4	16.1	10.0	0	7.0
9,350			2,380	44,770	11,180	-	380
0	0	0	7,610	4,750	1,620	1,570	110
			0.1	7.3	10.0	0	1.0
			400	13,520	7,450	-	40
2,830	7,850	48,900	17,480	10,910	3,720	3,600	250
1.4	1.4	1.4	0.9	33.0	11.7	16.5	30.7
2,540	7,030	43,810	8,180	140,410	20,020	17,820	2,610
1,490	1,890	62,130	18,950	11,830	4,030	3,900	270
70.0	81.0	81.0	82.8	29.0	71.2	34.0	80.0
(2)64,210	(2)90,950	(2)3,177,010	(2)807,730	(2)87,660	(2)127,960	(2)21,960	(2)4,730
990	1,490	68,740	20,490	12,790	4,360	4,210	290
56.0	60.0	61.0	55.5	75.0	71.2	37.8	40.5
35,480	57,220	2,683,610	585,790	374,110	142,800	47,740	3,990
1,340	1,290	65,500	19,600	12,230	4,170	4,030	280
0.7	0.7	0.7	0.1	7.3	10.0	0	1.0
600	580	28,340	1,020	34,820	19,180	-	100
2,040	2,830	56,610	17,980	11,220	3,830	3,700	260
5.6	5.8	6.0	5.2	58.0	17.8	49.8	61.8
7,310	10,500	217,380	48,620	253,800	31,360	55,280	5,460
7,850	14,160	35,040	16,990	10,600	3,620	3,490	240
75.0	78.0	78.0	70.0	42.0	71.8	35.0	81.0
376,800	706,870	1,749,200	618,440	173,630	119,560	36,650	6,610
2,040	2,830	57,060	18,260	11,400	3,890	3,760	260
4.1	4.2	4.4	3.7	52.8	16.0	51.5	64.7
5,350	7,610	160,680	35,130	234,750	28,630	58,090	5,720
477,920	482,020	1,690,390	755,840	495,510	175,520	99,625	11,470
3,658,530	4,210,980	16,566,440	6,639,580	5,946,120	2,094,885	1,119,060	116,700
8.67	7.65	9.80	8.78	12.00	11.93	11.23	10.17

eral minor floods eliminated.
ing year.

PLATE NO. B-2

WABASH RIVER REACH W-4 Outside Levees

Stage - Damage Curve
Area in Acres

Stage	Total Area Inundated Acres	Damage per Acre	Corn Land Use 49.7% 1' $7.57	2' $8.67	3' $7.65	3'+ $9.80	Soybeans L.U. 14.1% $8.78	Wh L.U. $12
14.0	0	Area	0	0	0	0	0	
		Damage	-	-	-	-	-	-
15.0	620	Area	310	0	0	0	90	
		Damage	2,350	-	-	-	790	
16.0	10,990	Area	5,150	310	0	0	1,550	
		Damage	38,990	2,690	-	-	13,610	11,
17.0	28,610	Area	8,760	5,150	310	0	4,030	2,
		Damage	66,310	44,650	2,370	-	35,380	30,
18.0	40,690	Area	6,000	8,760	5,150	310	5,740	3,
		Damage	45,420	75,950	39,400	3,040	50,400	42,
19.0	44,400	Area	1,840	6,000	8,760	5,460	6,260	3,
		Damage	13,930	52,020	67,010	53,510	54,960	46,
20.0	46,620	Area	1,100	1,840	6,000	14,220	6,570	4,
		Damage	8,330	15,950	45,900	139,360	57,680	49,
21.0	48,780	Area	1,070	1,100	1,840	20,220	6,880	4,
		Damage	8,100	9,540	14,080	198,160	60,410	51,
22.0	50,300	Area	760	1,070	1,100	22,060	7,090	4,
		Damage	5,750	9,280	8,420	216,190	62,250	53,
25.0(1)	52,390	Area	100	410	520	24,100	7,390	4,
		Damage	760	3,550	3,980	236,180	64,880	55,
26.0	54,460	Area	1,030	100	410	24,620	7,680	4,
		Damage	7,800	870	3,140	241,280	67,430	57,
27.0	55,620	Area	580	1,030	100	25,030	7,840	4,
		Damage	4,390	8,930	770	245,290	68,840	58,
28.0	56,760	Area	570	580	1,030	25,130	8,000	4,
		Damage	4,310	5,030	7,880	246,270	70,240	59,
29.0	57,460	Area	350	570	580	26,160	8,100	5,
		Damage	2,650	4,490	4,440	256,370	71,120	60,
30.0	58,650	Area	590	350	570	26,740	8,270	5,
		Damage	4,470	3,030	4,360	262,050	72,610	61,
31.0	60,350	Area	840	590	350	27,310	8,510	5,
		Damage	6,360	5,120	2,680	267,640	74,720	63,
32.0	61,500	Area	570	840	590	27,660	8,670	5,
		Damage	4,310	7,280	4,510	271,070	76,120	64,

(1) Stage 23.0 and 24.0 omitted.

2

Sample Crop Damage Curve Computations

Stage - Damage Curve Computations

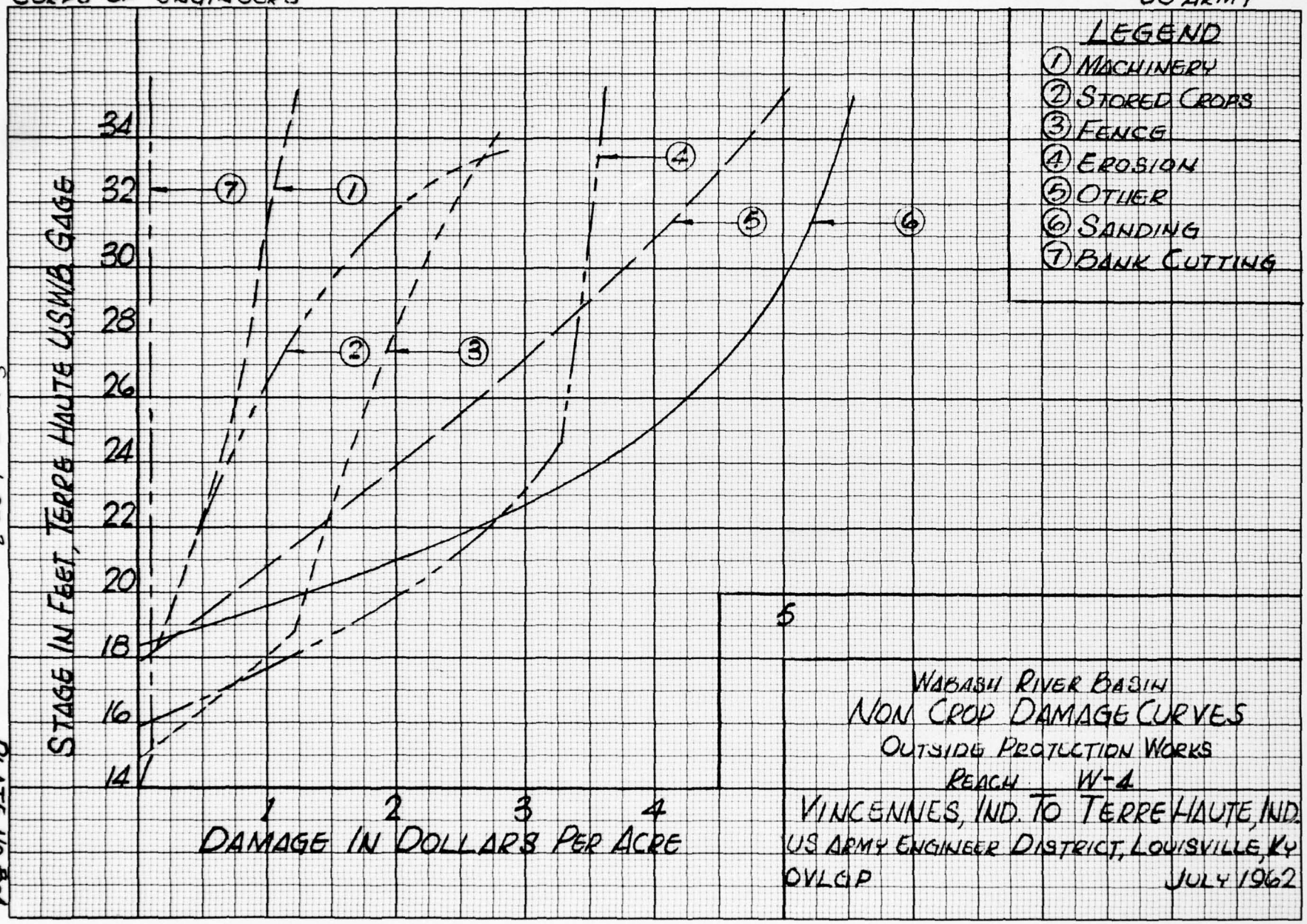
Area in Acres | Damage in Dollars | Gage - Terre Haute, Indiana

Land Use 49.7%		Soybeans	Wheat	Hay	Pasture	Oats	Damage
3' $7.65	3'+ $9.80	L.U. 14.1% $8.78	L.U. 8.8% $12.00	L.U. 3.0% $11.93	L.U. 2.9% $11.23	L.U. 0.2% $10.17	Total
0	0	0	0	0	0	0	
-	-	-	-	-	-	-	-
0	0	90	50	20	20	1	
-	-	790	600	240	220	10	4,210
0	0	1,550	970	330	320	22	
-	-	13,610	11,640	3,940	3,590	220	74,680
310	0	4,030	2,520	860	830	57	
2,370	-	35,380	30,240	10,260	9,320	580	199,110
5,150	310	5,740	3,580	1,220	1,180	81	
39,400	3,040	50,400	42,960	14,550	13,250	820	285,790
8,760	5,460	6,260	3,910	1,330	1,290	89	
67,010	53,510	54,960	46,920	15,870	14,490	910	319,620
6,000	14,220	6,570	4,100	1,400	1,350	93	
45,900	139,360	57,680	49,200	16,700	15,160	950	349,230
1,840	20,220	6,880	4,290	1,460	1,410	98	
14,080	198,160	60,410	51,480	17,420	15,830	1,000	376,020
1,100	22,060	7,090	4,430	1,510	1,460	101	
8,420	216,190	62,250	53,160	18,010	16,400	1,030	390,490
520	24,100	7,390	4,610	1,570	1,520	105	
3,980	236,180	64,880	55,320	18,730	17,070	1,070	401,540
410	24,620	7,680	4,790	1,630	1,580	109	
3,140	241,280	67,430	57,480	19,450	17,740	1,110	416,300
100	25,030	7,840	4,890	1,670	1,610	111	
770	245,290	68,840	58,680	19,920	18,080	1,130	426,030
1,030	25,130	8,000	4,990	1,700	1,640	113	
7,880	246,270	70,240	59,880	20,280	18,420	1,150	433,460
580	26,160	8,100	5,060	1,720	1,660	115	
4,440	256,370	71,120	60,720	20,520	18,640	1,170	440,570
570	26,740	8,270	5,160	1,760	1,700	117	
4,360	262,050	72,610	61,920	21,000	19,090	1,190	449,720
350	27,310	8,510	5,310	1,810	1,750	121	
2,680	267,640	74,720	63,720	21,590	19,650	1,230	462,710
590	27,660	8,670	5,410	1,850	1,790	123	
4,510	271,070	76,120	64,920	22,070	20,100	1,250	471,630

PLATE NO. B-3

CORPS OF ENGINEERS

US ARMY



5

WABASH RIVER BASIN

NON CROP DAMAGE CURVES

OUTSIDE PROTECTION WORKS

REACH W-4

VINCENNES, IND. TO TERRE HAUTE, IND.

US ARMY ENGINEER DISTRICT, LOUISVILLE, KY

OVLGP

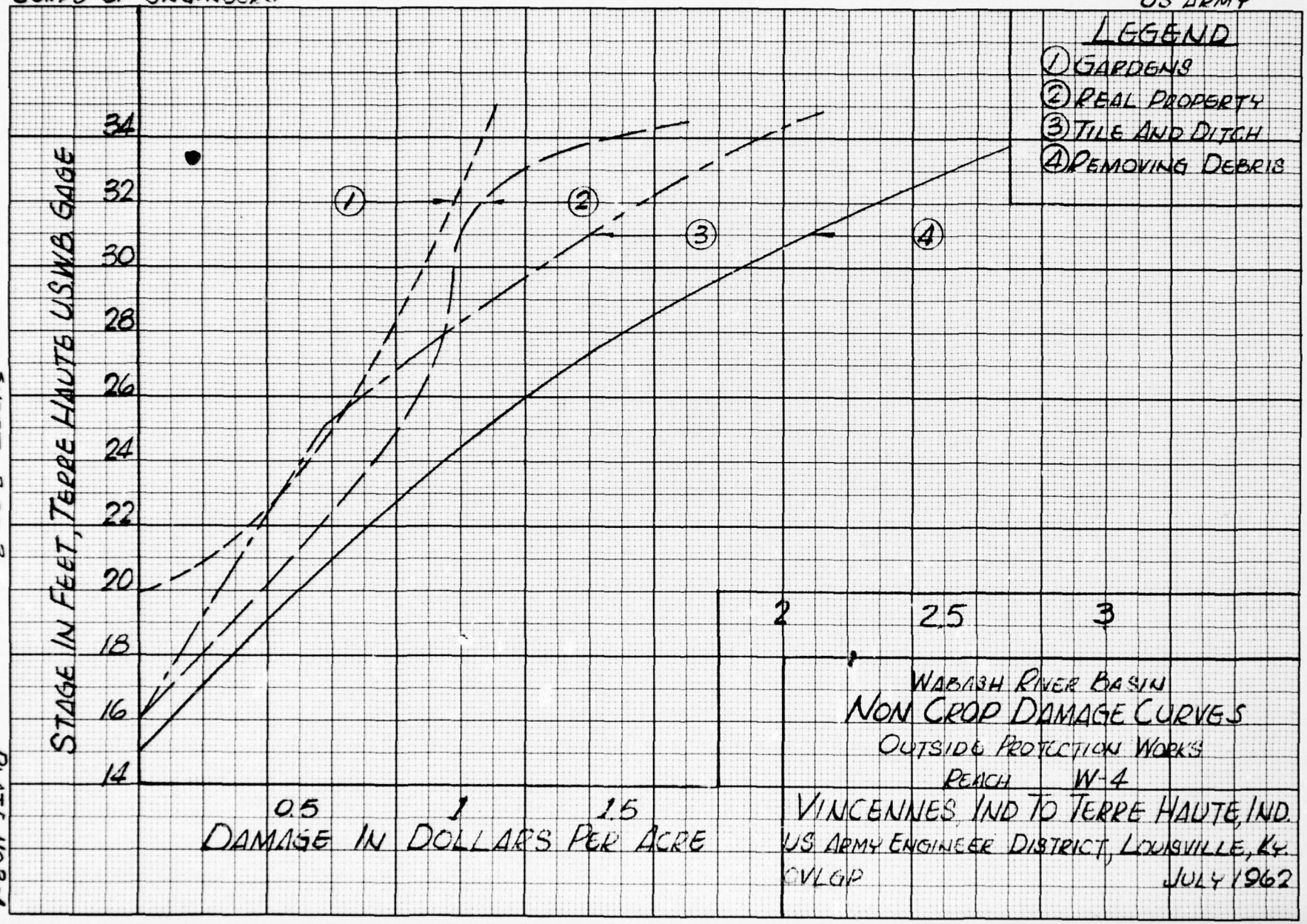
JULY 1962

SHEET 1 OF 3

PLATE NO. B-4

CORPS OF ENGINEERS

US ARMY



WABASH RIVER BASIN

NON CROP DAMAGE CURVES

OUTSIDE PROTECTION WORKS

REACH W-4

VINCENNES, IND TO TERRE HAUTE, IND.

US ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

CVLGP

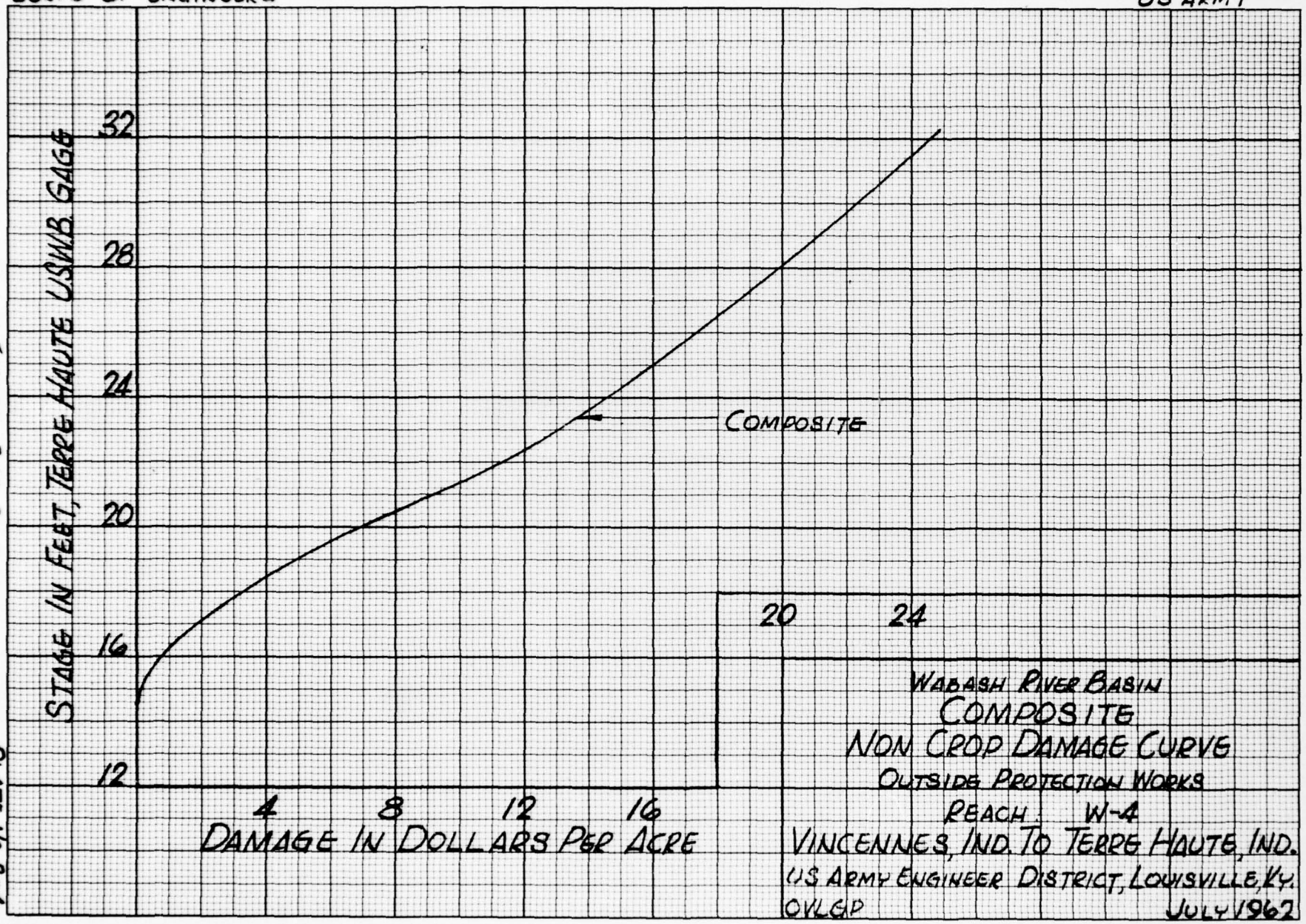
JULY 1962

SHEET 2 OF 3

PLATE NO B-4

CORPS OF ENGINEERS

US ARMY



WABASH RIVER BASIN

COMPOSITE

NON CROP DAMAGE CURVE

OUTSIDE PROTECTION WORKS

REACH W-4

VINCENNES, IND. TO TERRE HAUTE, IND.

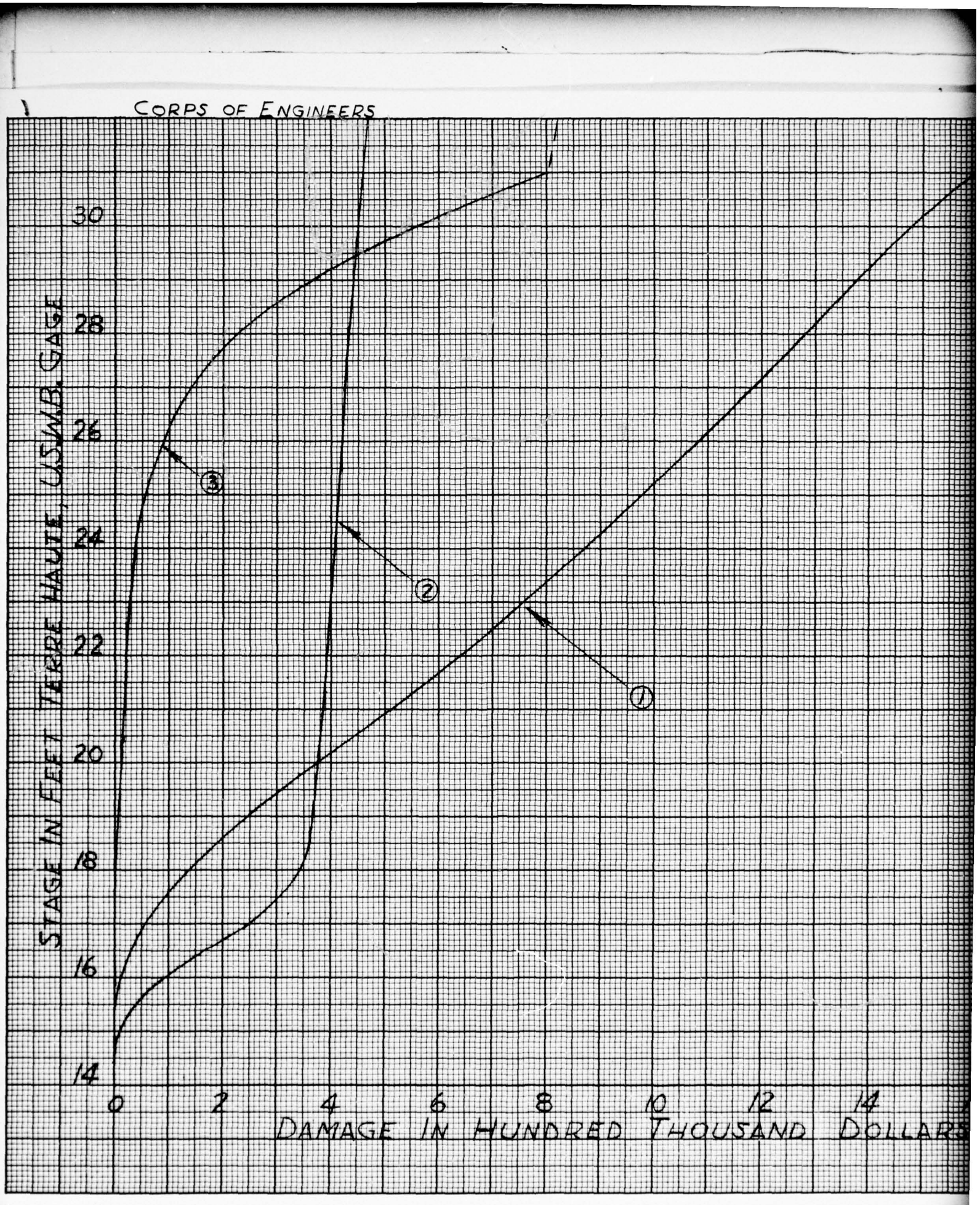
US ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

OVLGP

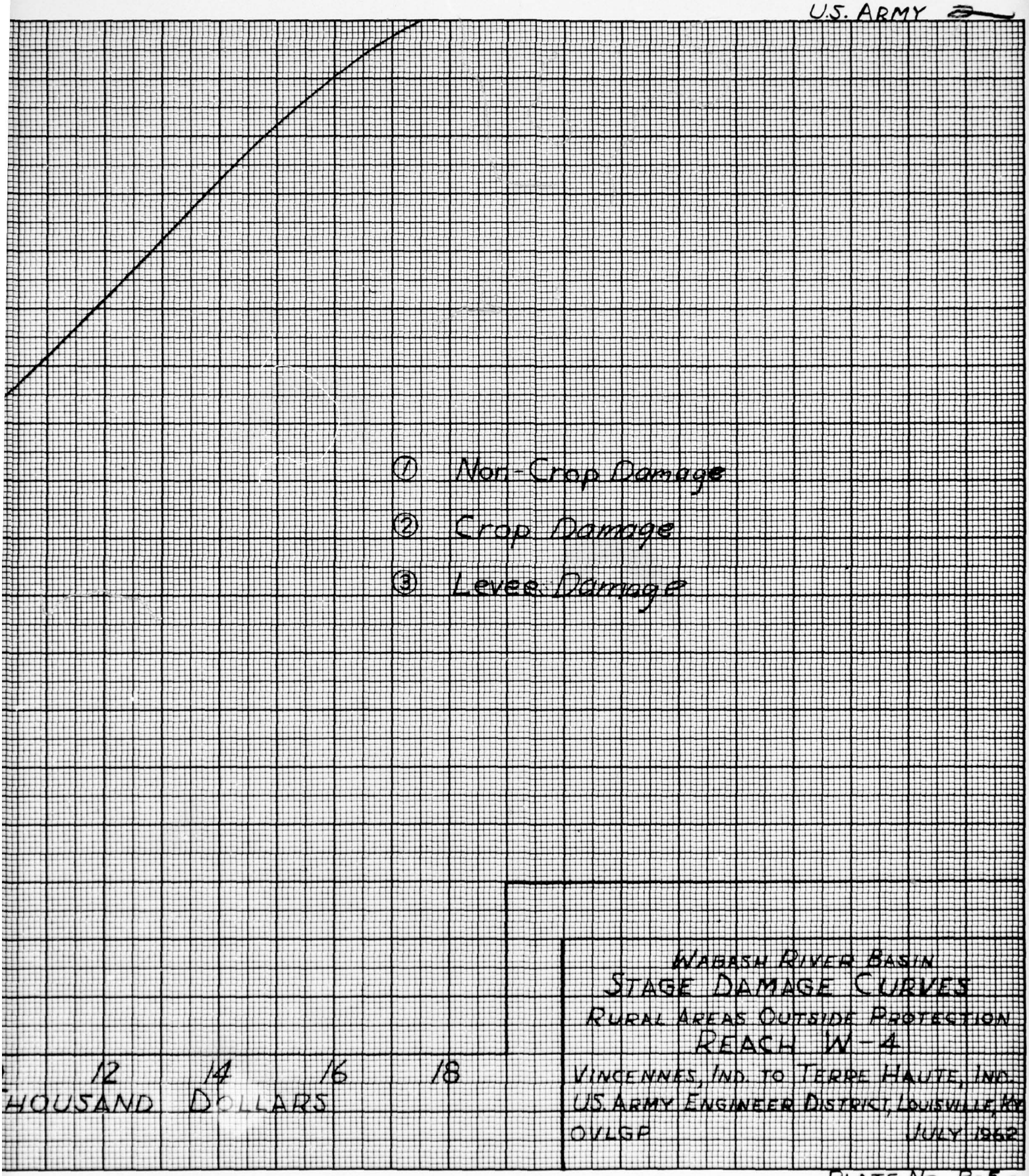
JULY 1962

SHEET 3 OF 3

PLATE NO B-4


CORPS OF ENGINEERS
STAGE IN FEET TERRE HAUTE, USWB GAGE
30
28
26
24
22
20
18
16
14
0
2
4
6
8
10
12
14
DAMAGE IN HUNDRED THOUSAND DOLLARS
1
2
3

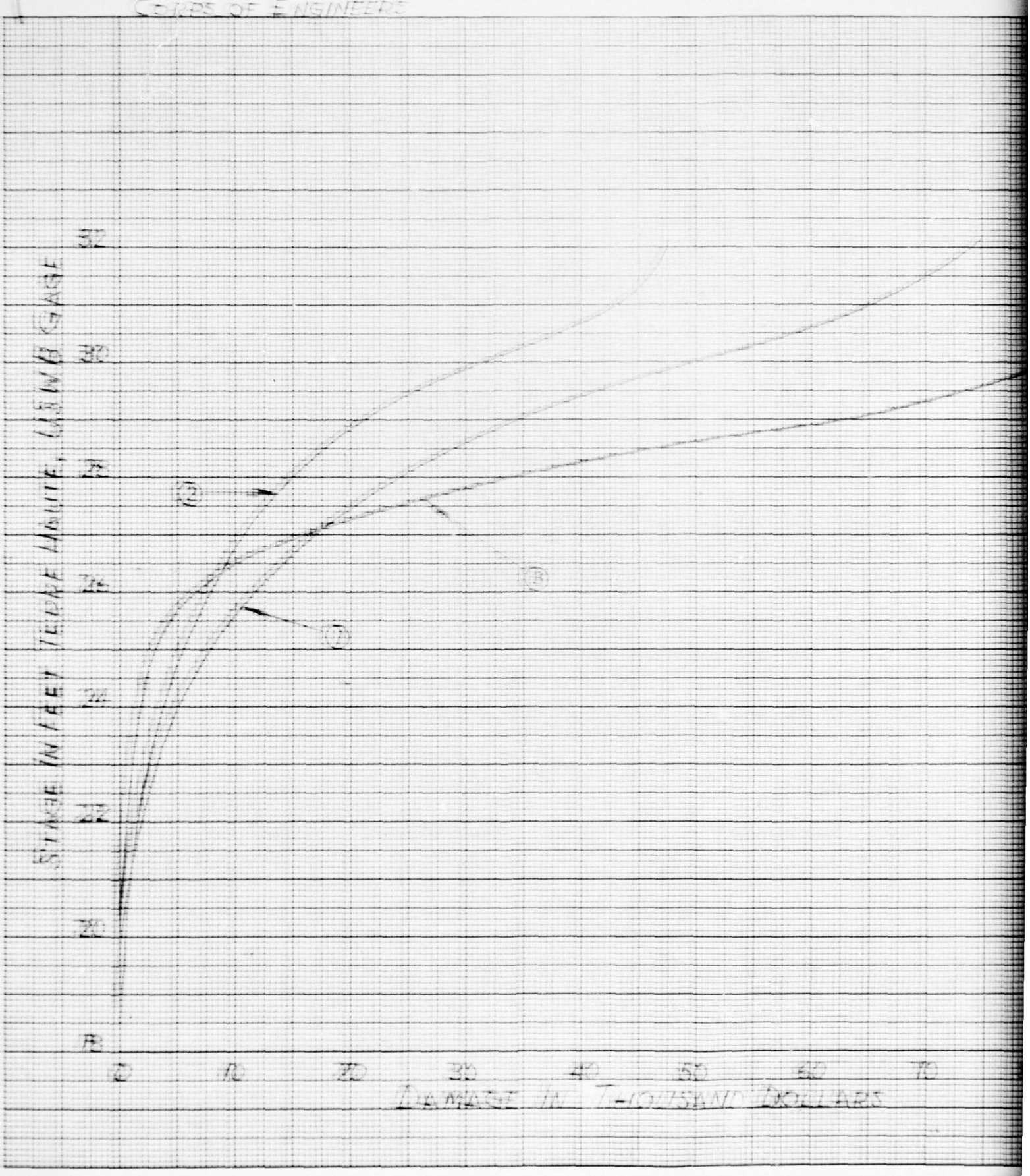
U.S. ARMY



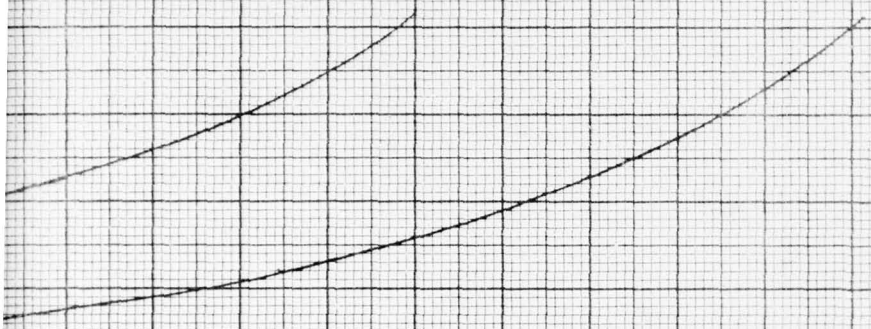
WABASH RIVER BASIN
STAGE DAMAGE CURVES
RURAL AREAS OUTSIDE PROTECTION
REACH W-4
VINCENNES, IND. TO TERRE HAUTE, IND.
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY
OVLGP JULY 1962

PLATE NO. B-5a

CORPS OF ENGINEERS



U.S. ARMY 2



① York, Illinois

② Hutsonville, Illinois

③ Taylorsville, Indiana

100 110

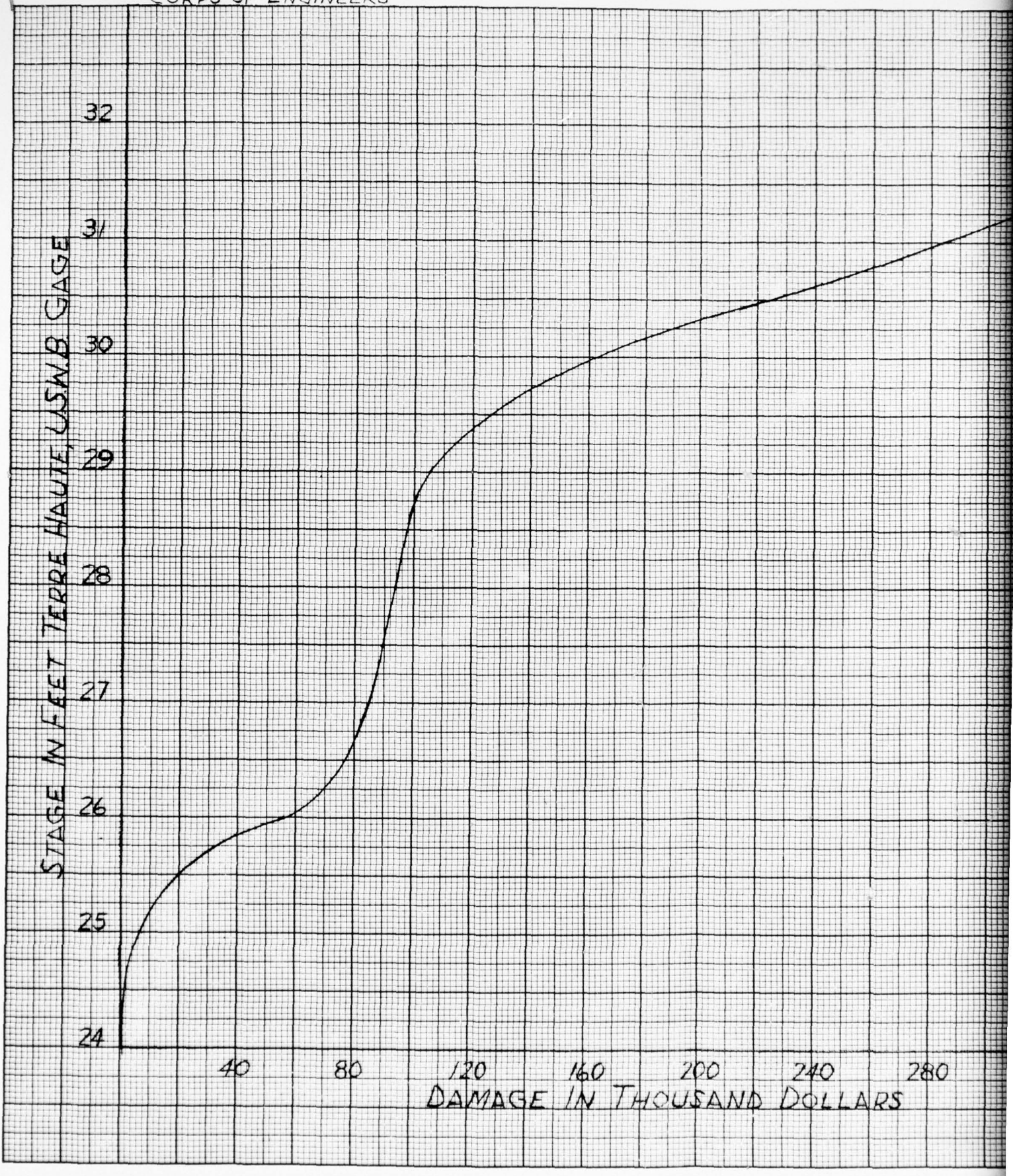
60 70 80 90

ND DOLLARS

WABASH RIVER BASIN
STAGE DAMAGE CURVES
URBAN AREAS OUTSIDE PROTECTION
REACH W-4
VINCENNES, IND. TO TERRE HAUTE, IND.
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY
OVLGP JULY 1962

PLATE No. B-56

CORPS OF ENGINEERS



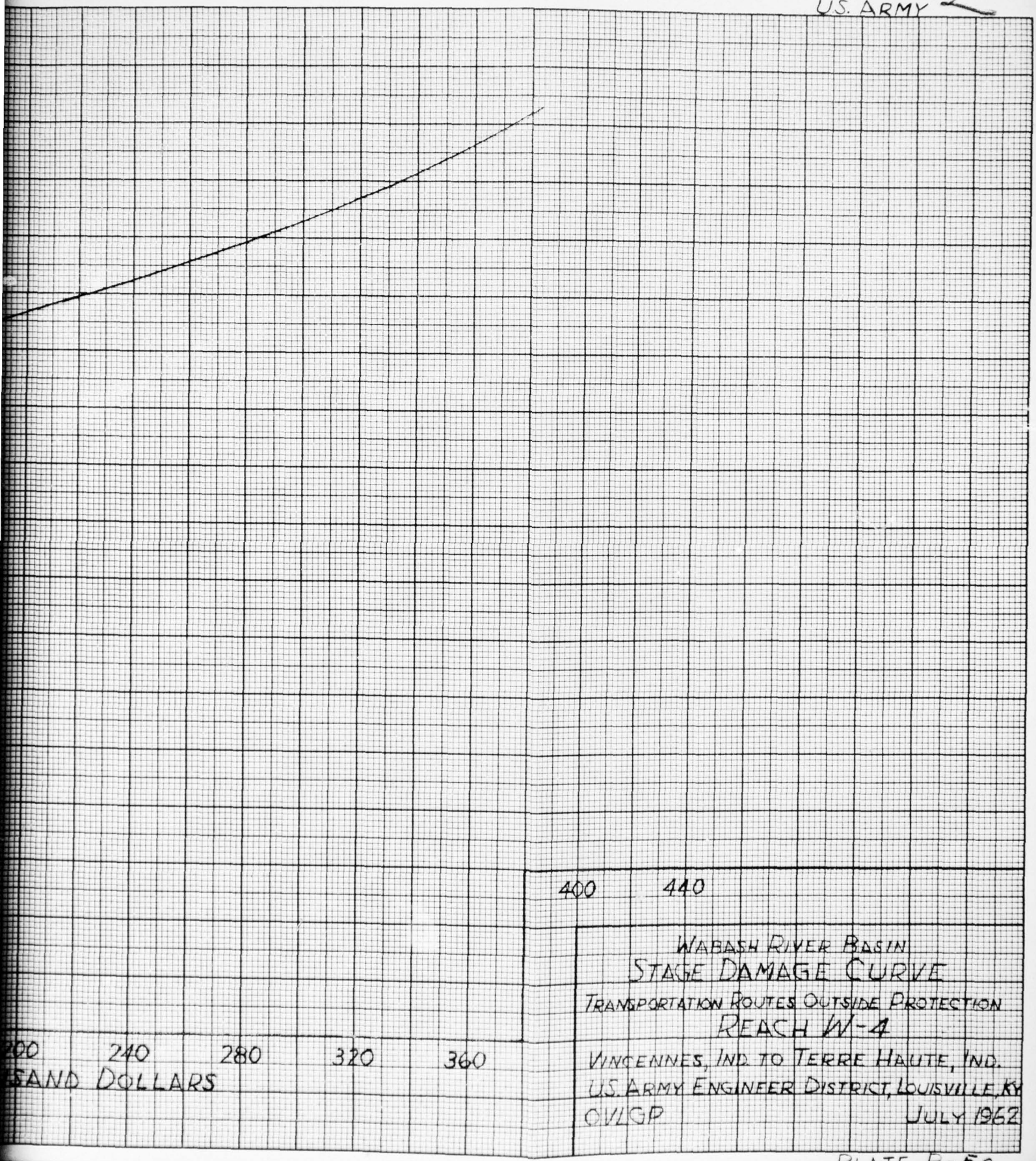
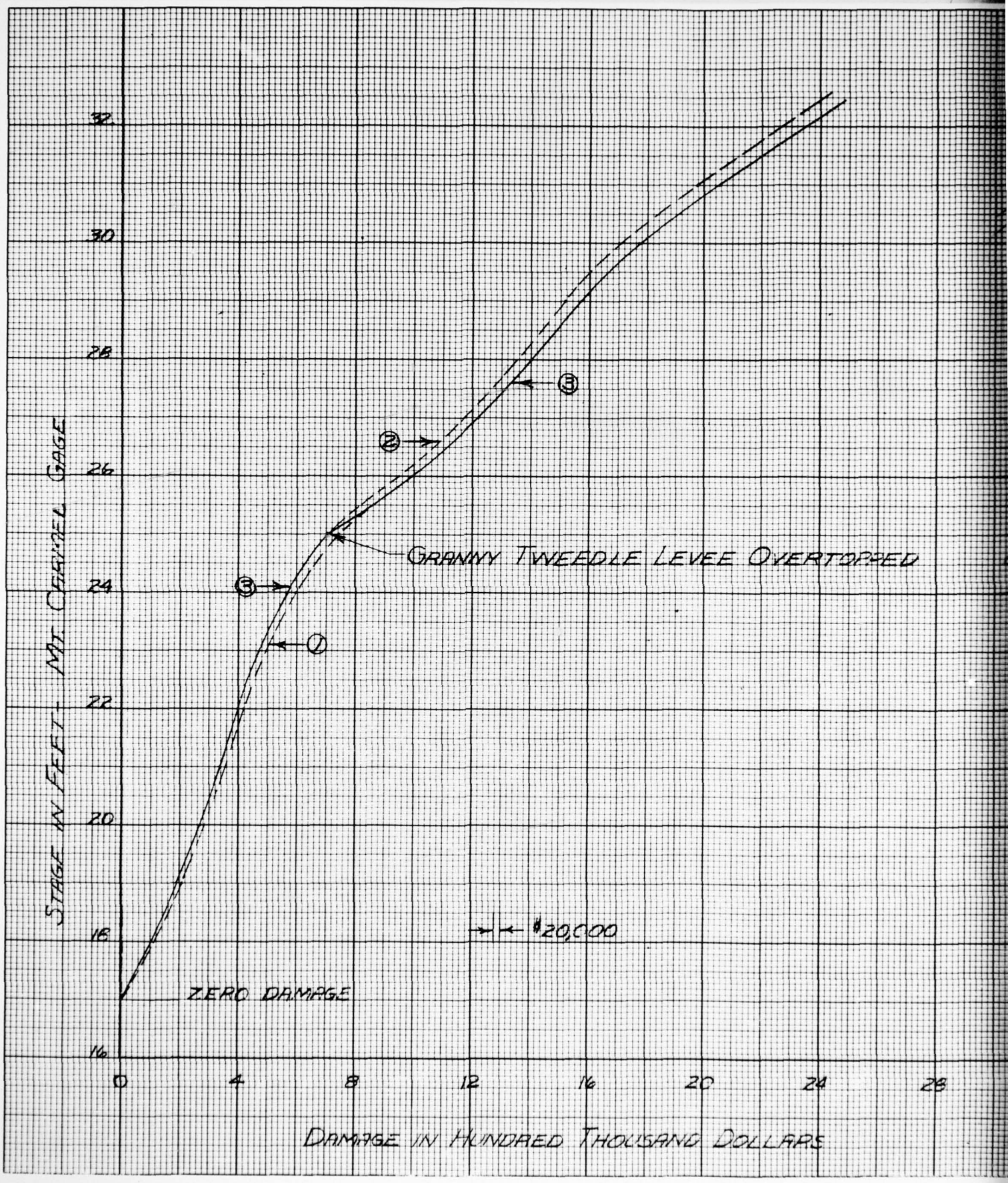

U.S. ARMY
400
440
200
240
280
320
360
SAND DOLLARS
WABASH RIVER BASIN
STAGE DAMAGE CURVE
TRANSPORTATION ROUTES OUTSIDE PROTECTION
REACH W-4
VINCENNES, IND. TO TERRE HAUTE, IND.
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY
OVLGP
JULY 1962

PLATE B-5c


32
30
28
26
24
22
20
18
16
0
4
8
12
16
20
24
28
STAGE IN FEET - MT. CERVIDEL GAGE
DAMAGE IN HUNDRED THOUSAND DOLLARS
GRANNY TWEEDLE LEVEE OVERTOPPED
ZERO DAMAGE
$20,000
1
2
3
3

LEGEND 2

1. TOTAL—NO PROTECTION WORKS CONSIDERED
2. UNPROTECTED AREAS—URBAN AND RURAL
3. TOTAL ACTUAL DAMAGE (SOLID LINE)

WABASH RIVER BASIN

STAGE DAMAGE CURVES WABASH RIVER

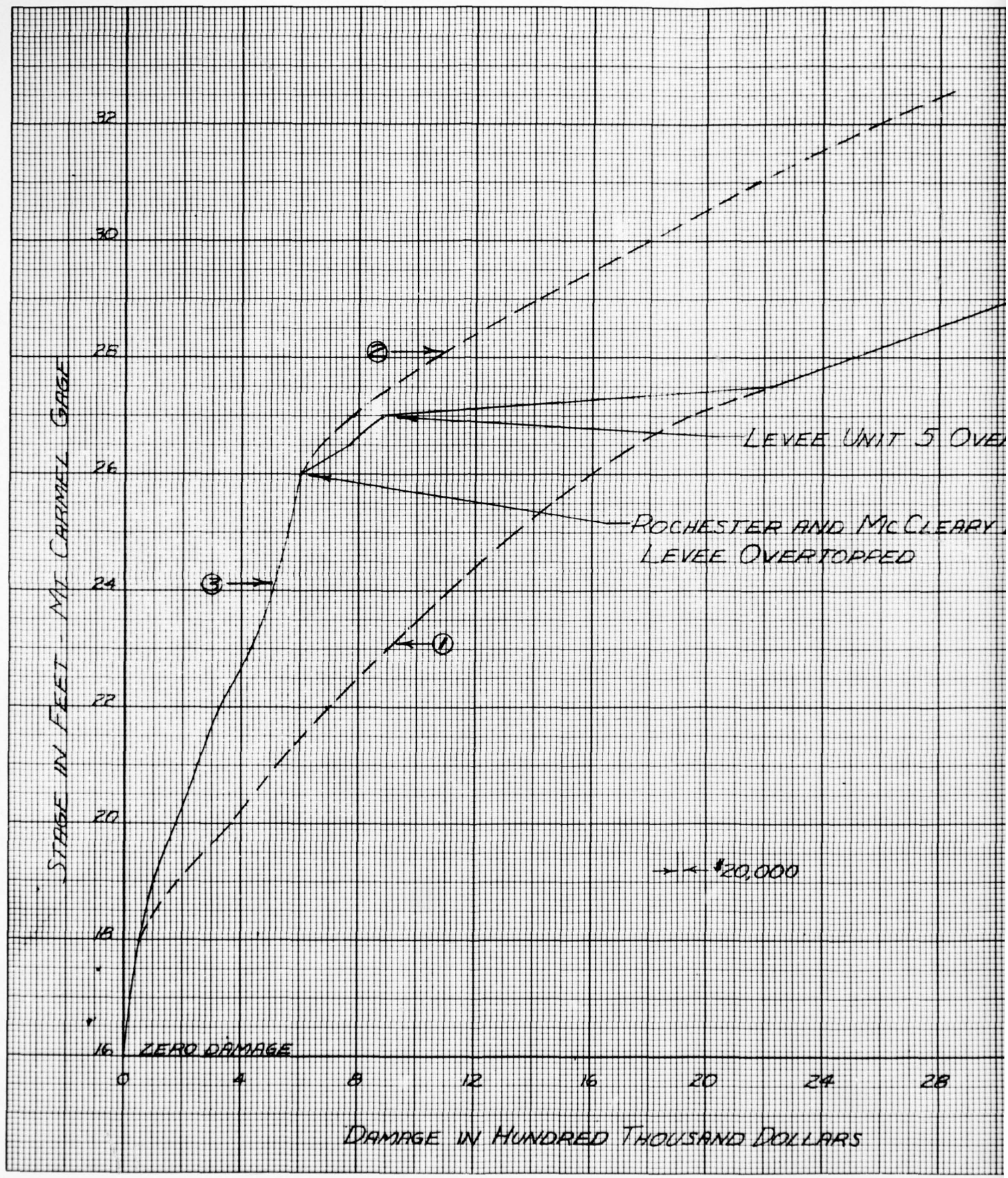
REACH W-1

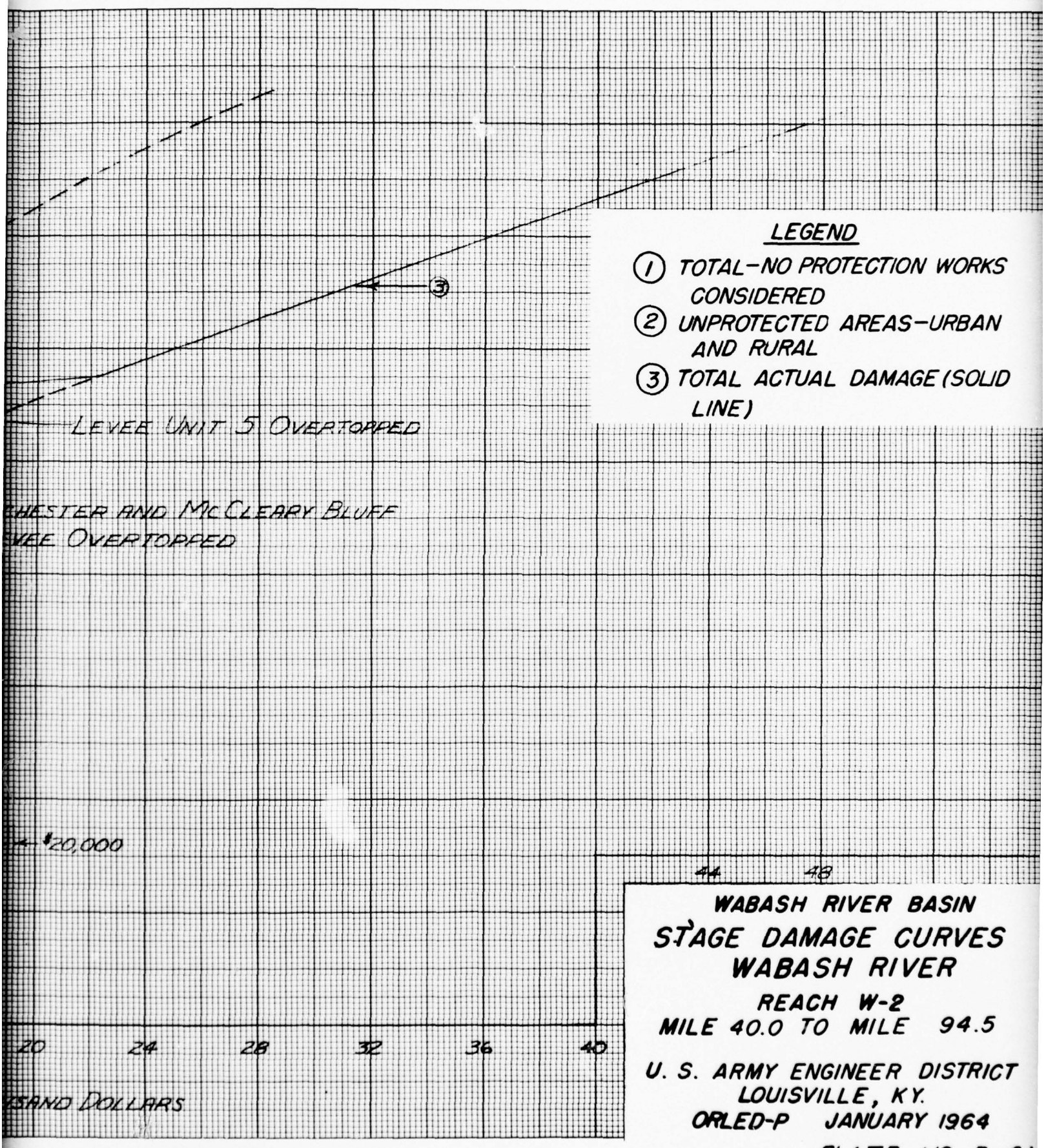
OHIO RIVER TO MILE 40.0

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-62


32
30
28
26
24
22
20
18
16
STAGE IN FEET - MT. CARMEL GAGE
ZERO DAMAGE
0
4
8
12
16
20
24
28
DAMAGE IN HUNDRED THOUSAND DOLLARS
LEVEE UNIT 5 OVE
ROCHESTER AND MC CLEARY
LEVEE OVERTOPPED
$20,000
1
2
3



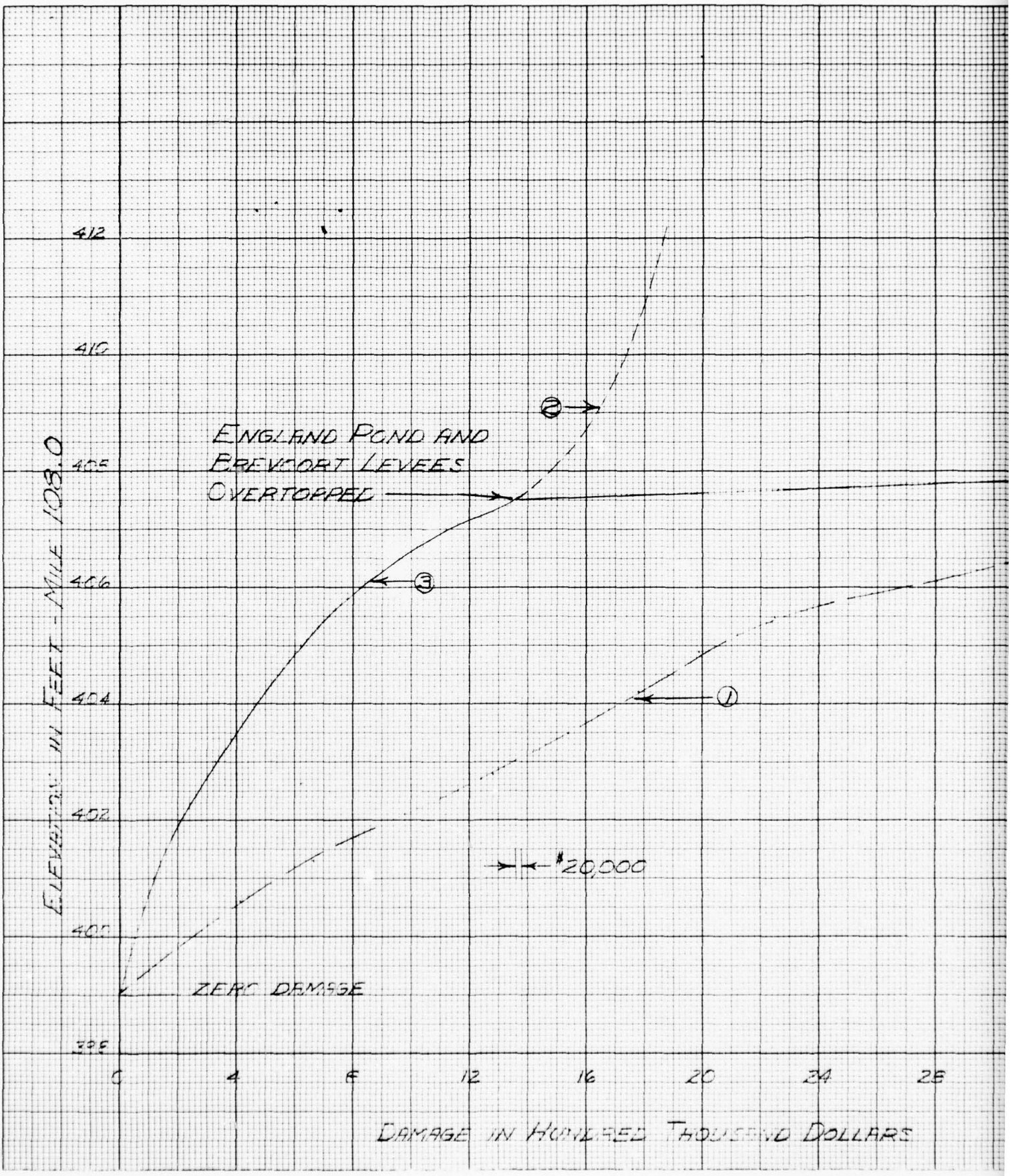
WABASH RIVER BASIN

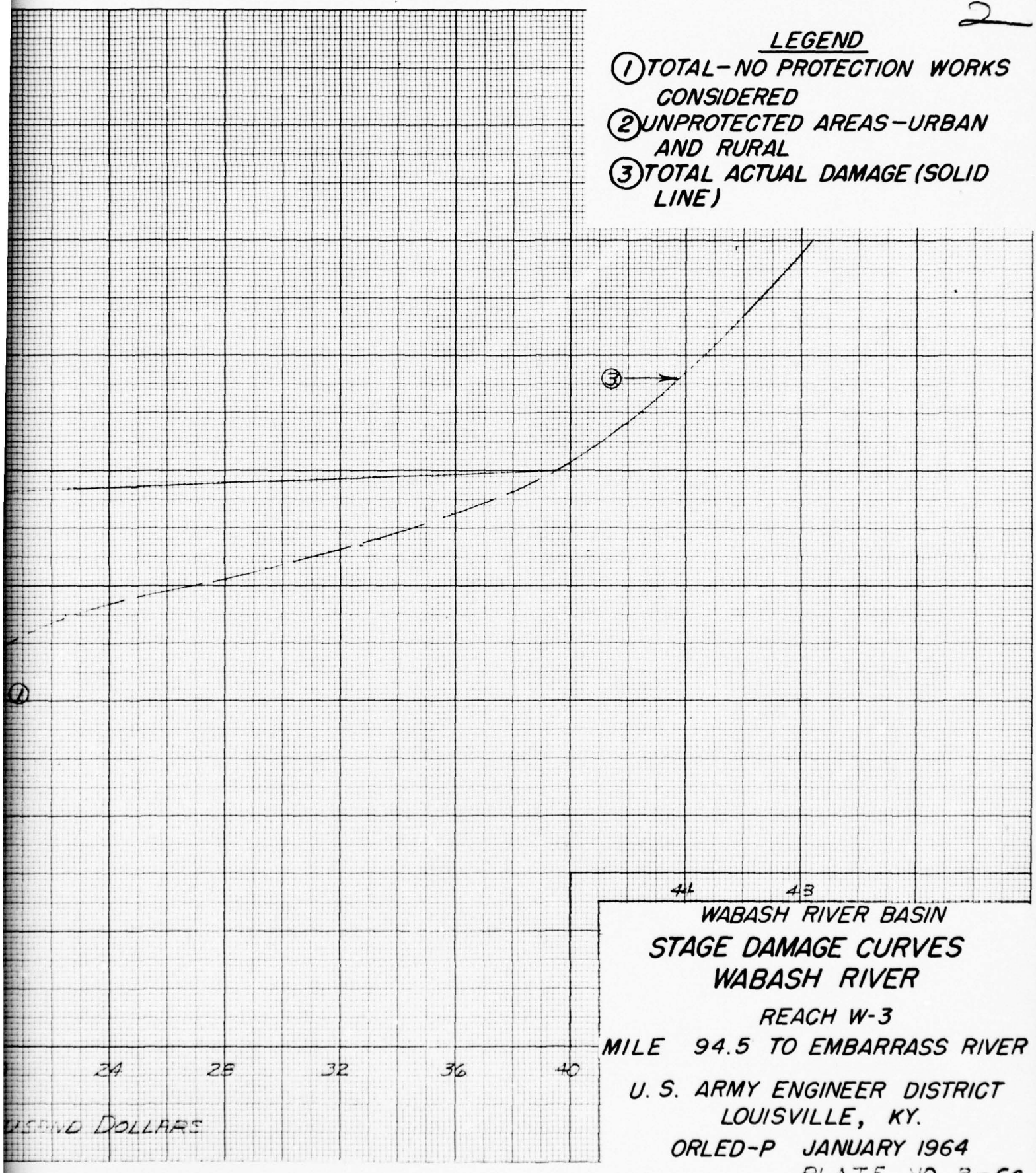
STAGE DAMAGE CURVES WABASH RIVER

REACH W-2
MILE 40.0 TO MILE 94.5

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6


412
410
408
406
404
402
400
398
ELEVATION IN FEET - MILE 103.0
ENGLAND POND AND
BREVOORT LEVEES
OVERTOPPED
2
3
1
20,000
ZERO DAMAGE
0
4
8
12
16
20
24
28
DAMAGE IN HUNDRED THOUSAND DOLLARS



WABASH RIVER BASIN

STAGE DAMAGE CURVES WABASH RIVER

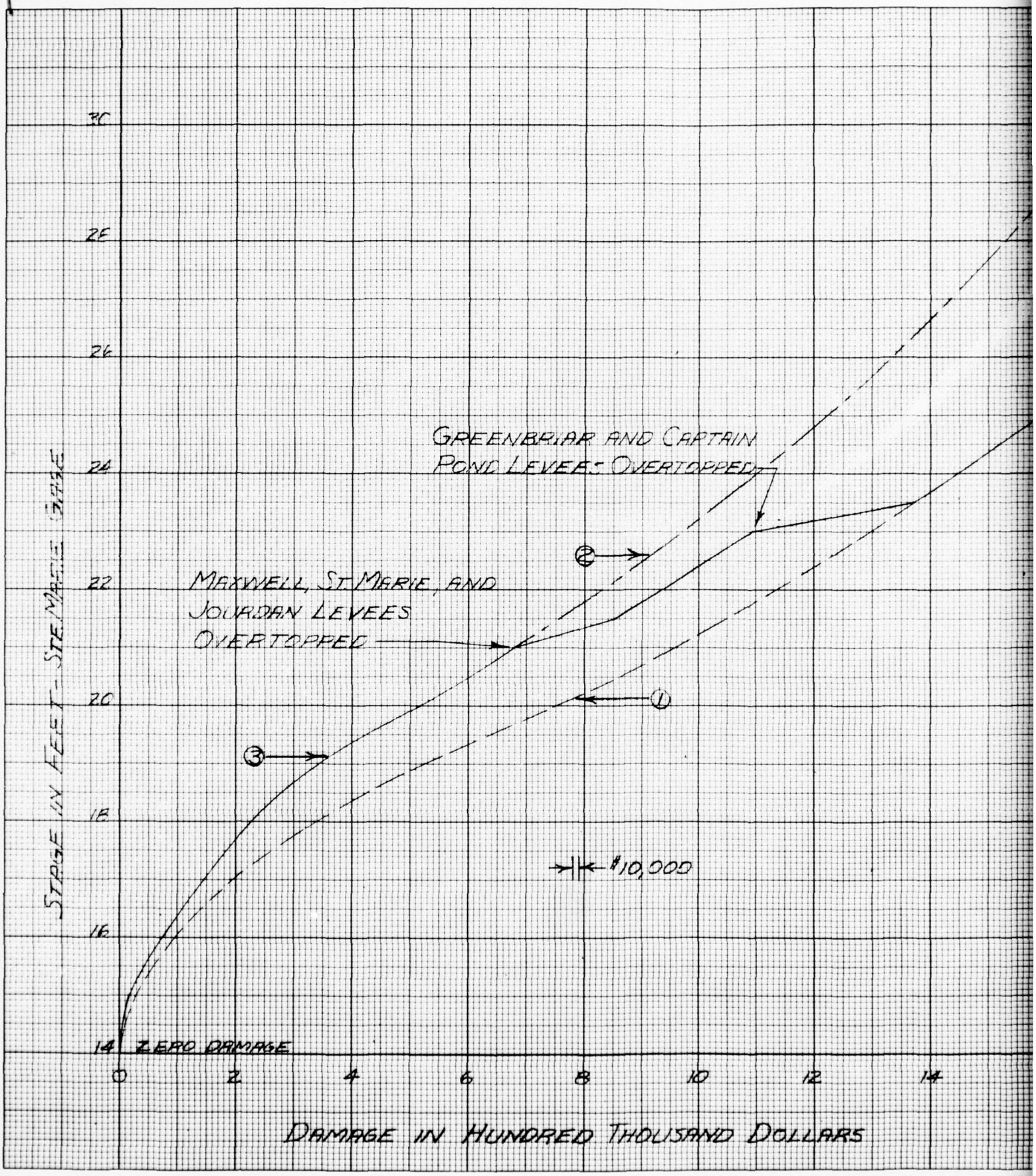
REACH W-3

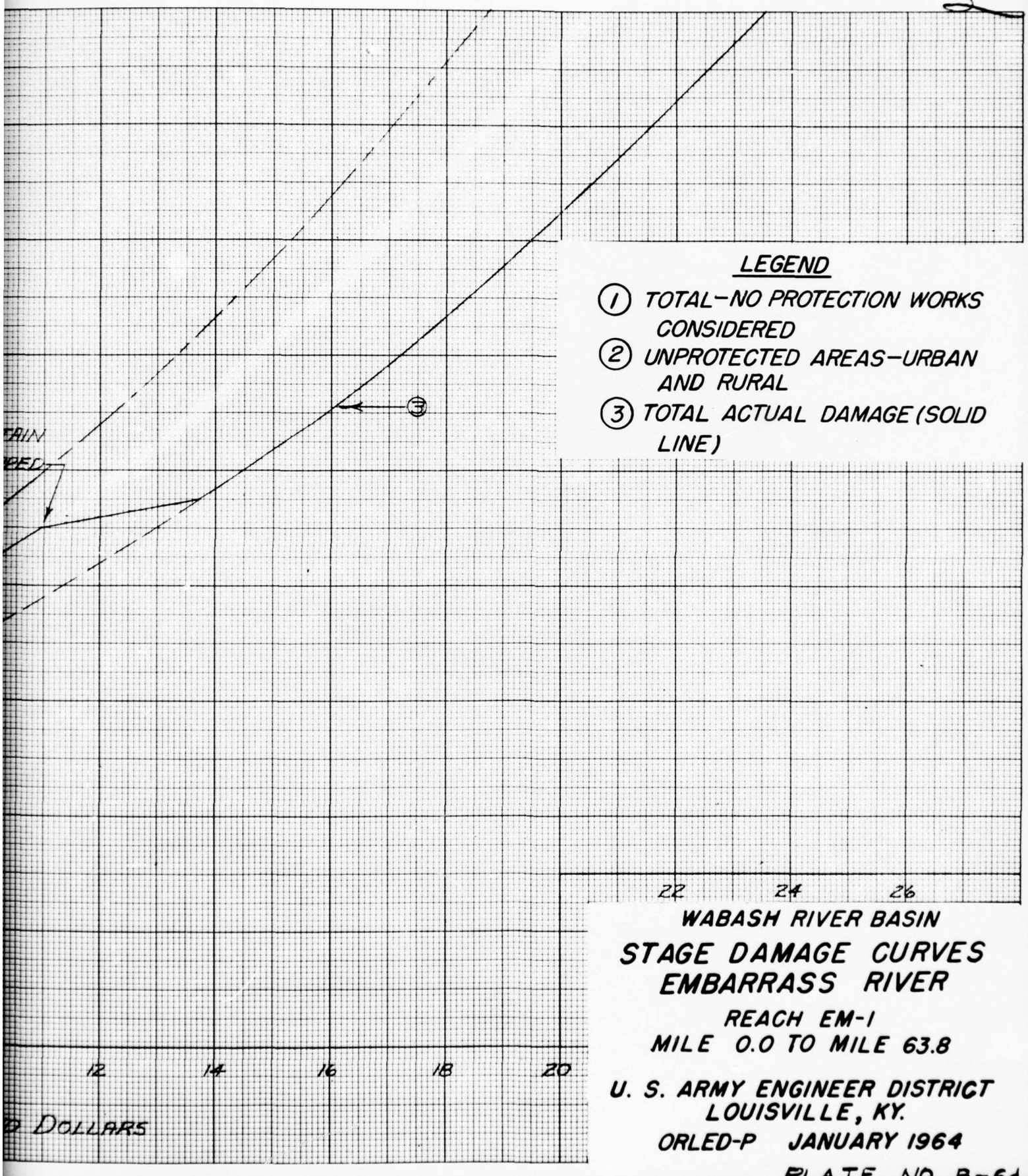
MILE 94.5 TO EMBARRASS RIVER

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-6c


STAGE IN FEET - STE. MARIE DATUM
DAMAGE IN HUNDRED THOUSAND DOLLARS
ZERO DAMAGE
GREENBRIAR AND CAPTAIN POND LEVEES OVERTOPPED
MAXWELL, ST. MARIE, AND JOURDAN LEVEES OVERTOPPED
$10,000
1
2
3
14
16
18
20
22
24
26
28
0
2
4
6
8
10
12
14



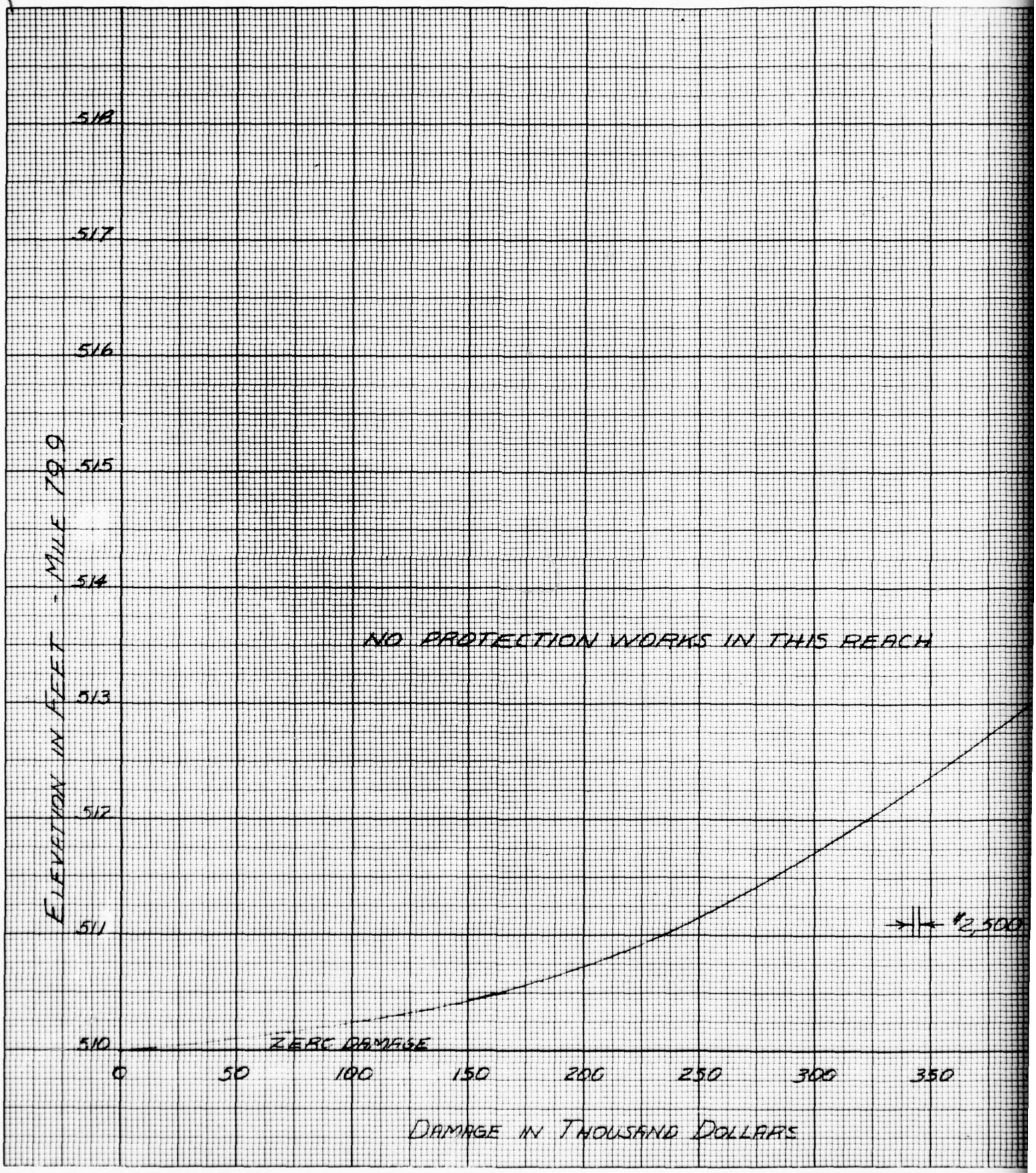
WABASH RIVER BASIN

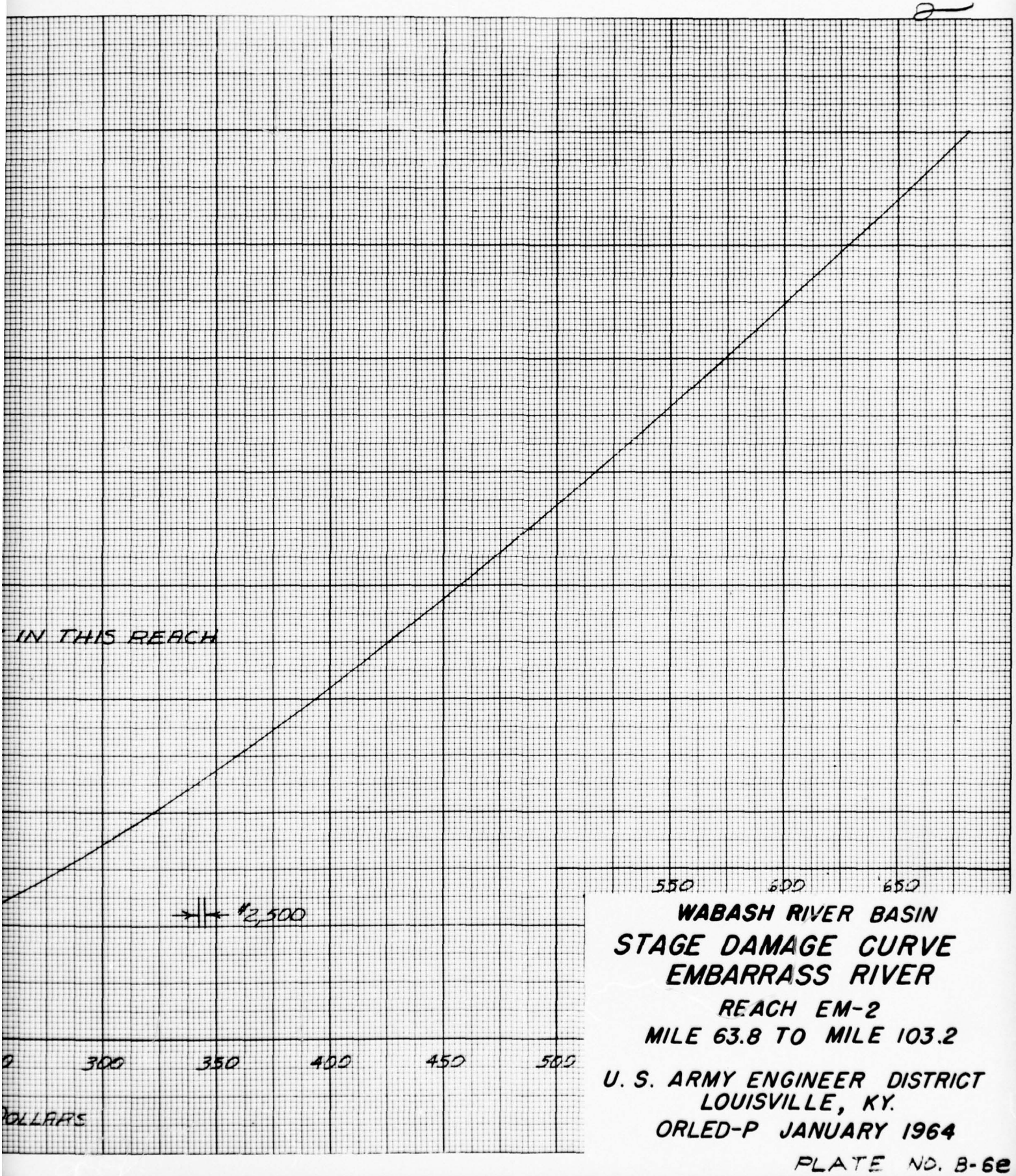
STAGE DAMAGE CURVES EMBARRASS RIVER

REACH EM-1
MILE 0.0 TO MILE 63.8

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-64.


518
517
516
515
514
513
512
511
510
ELEVATION IN FEET - MILE 79.9
NO PROTECTION WORKS IN THIS REACH
$2,500
ZERO DAMAGE
0
50
100
150
200
250
300
350
DAMAGE IN THOUSAND DOLLARS



WABASH RIVER BASIN

STAGE DAMAGE CURVE EMBARRASS RIVER

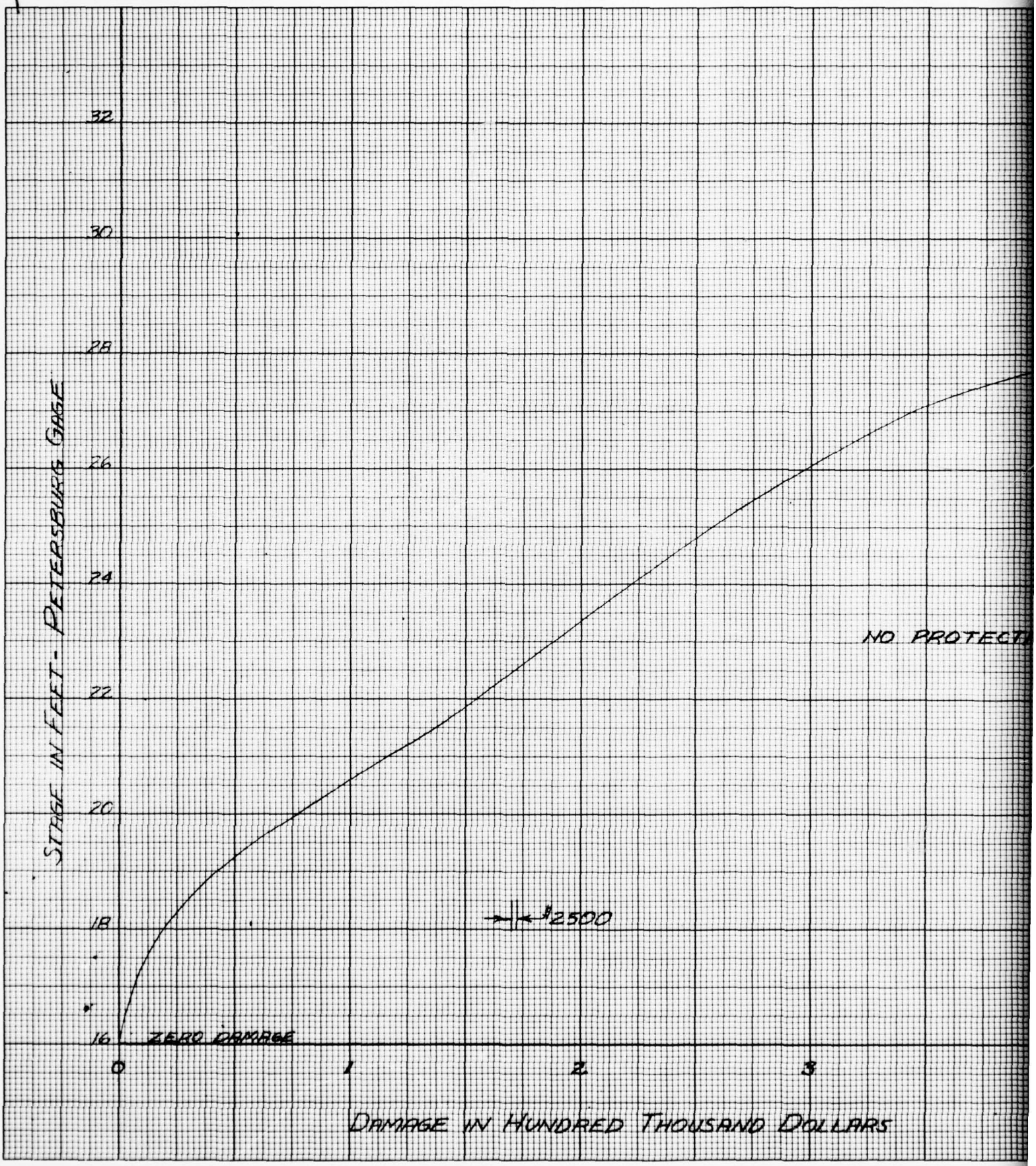
REACH EM-2

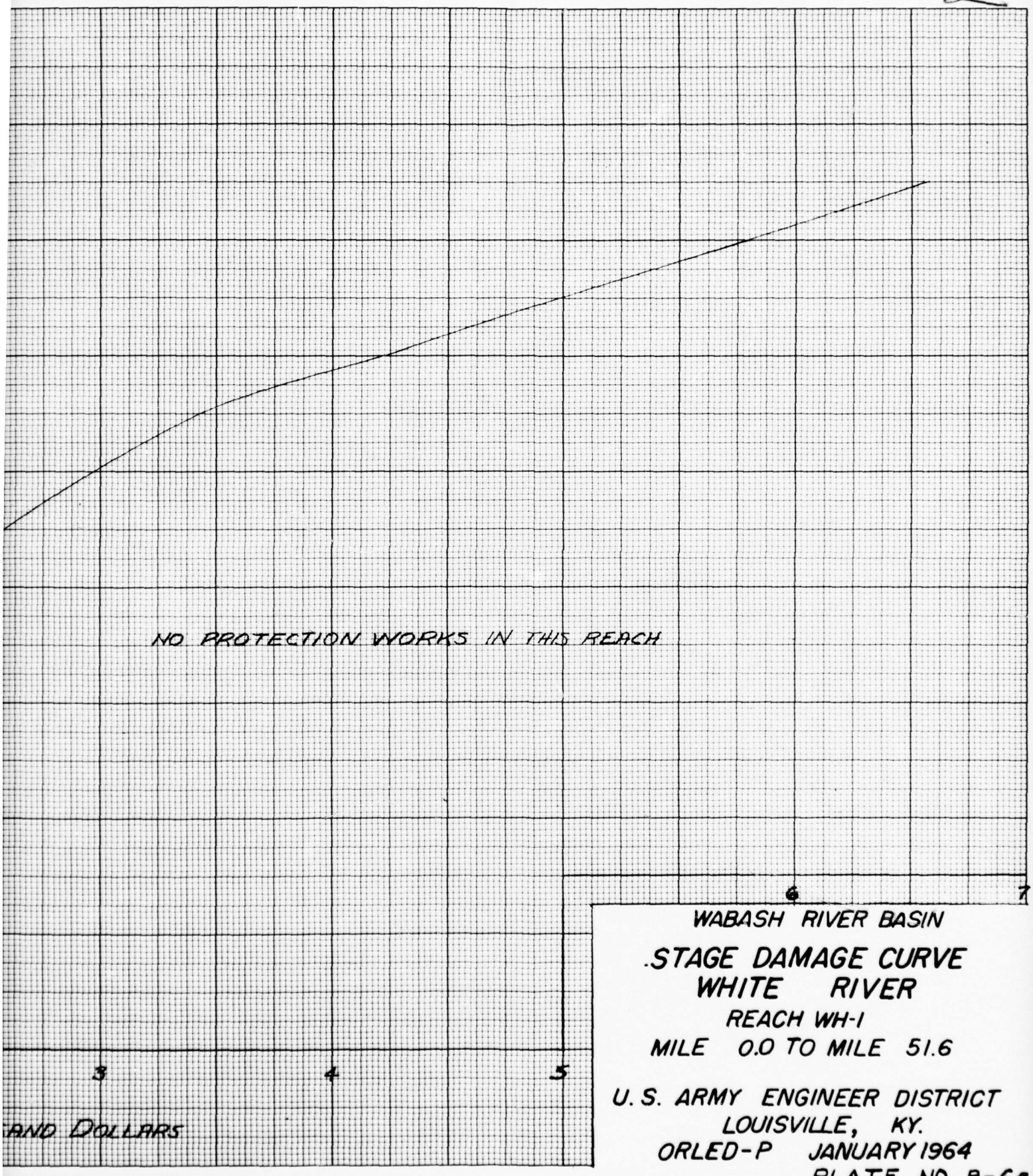
MILE 63.8 TO MILE 103.2

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-6e


32
30
28
26
24
22
20
18
16
STAGE IN FEET - PETERSBURG GAGE
NO PROTECT
$2500
ZERO DAMAGE
0
1
2
3
DAMAGE IN HUNDRED THOUSAND DOLLARS



WABASH RIVER BASIN

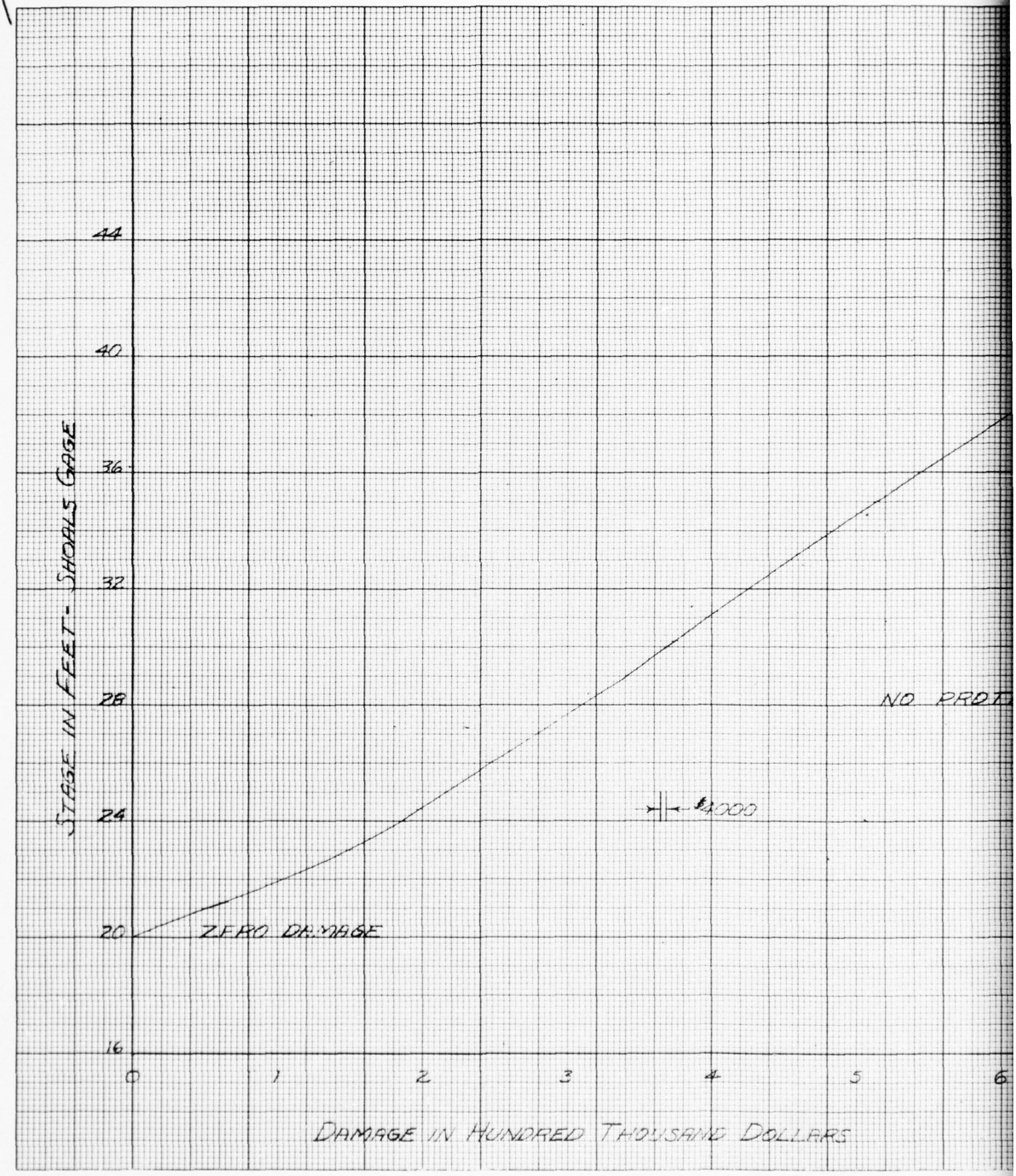
STAGE DAMAGE CURVE
WHITE RIVER

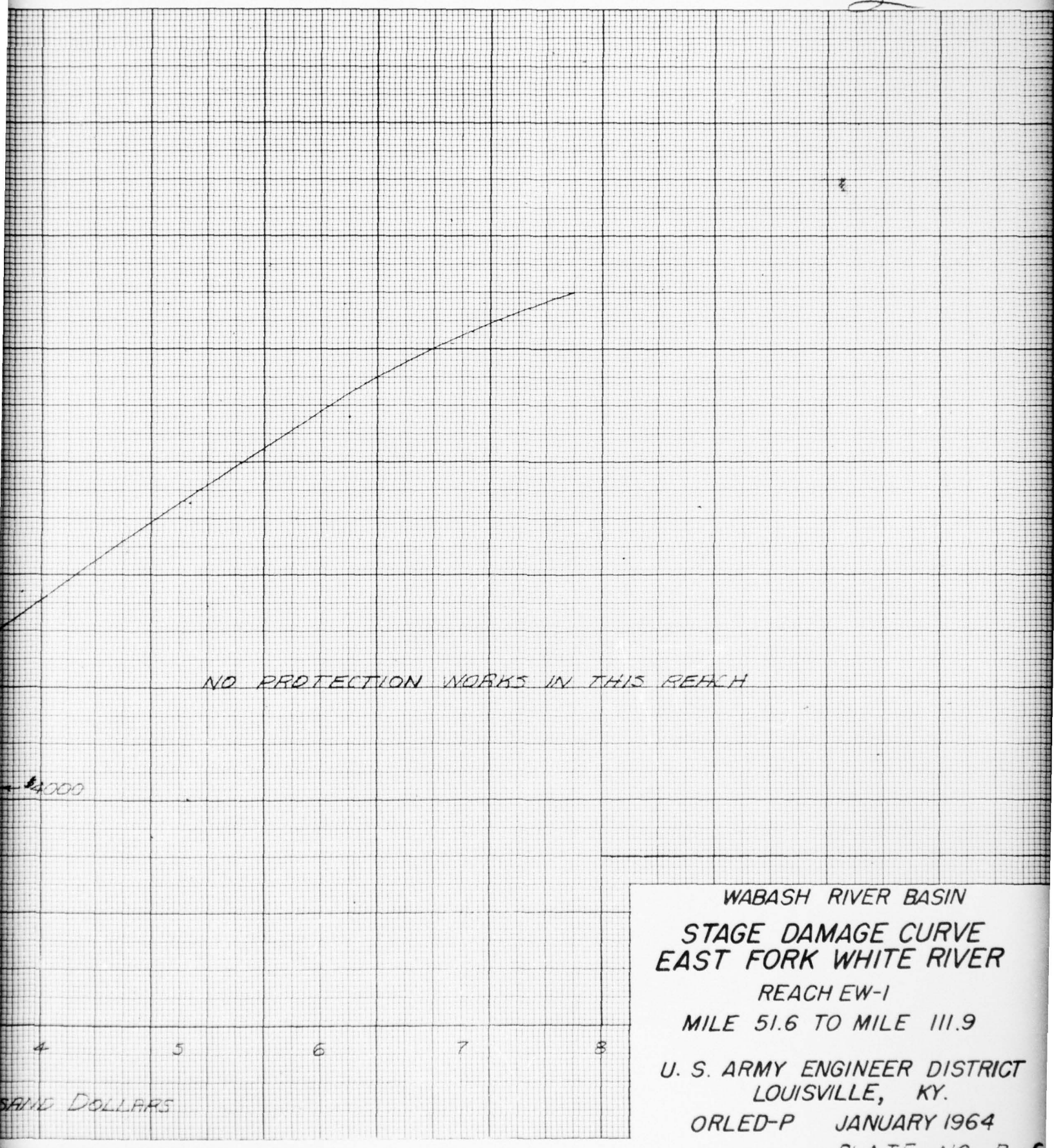
REACH WH-1

MILE 0.0 TO MILE 51.6

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6


STAGE IN FEET - SHOALS GAGE
44
40
36
32
28
24
20
16
0
1
2
3
4
5
6
ZERO DAMAGE
$4000
NO PROD
DAMAGE IN HUNDRED THOUSAND DOLLARS



WABASH RIVER BASIN

STAGE DAMAGE CURVE EAST FORK WHITE RIVER

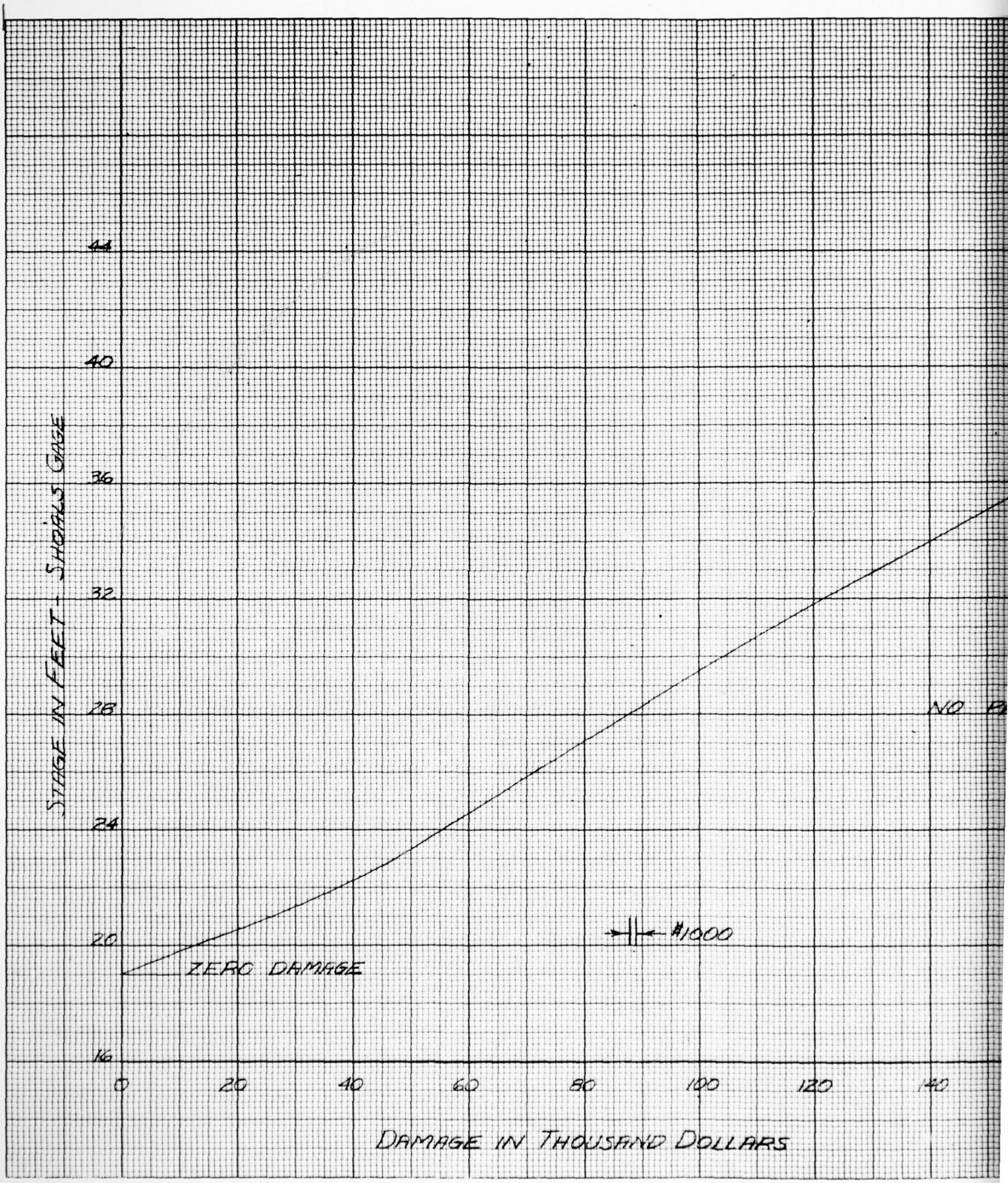
REACH EW-1

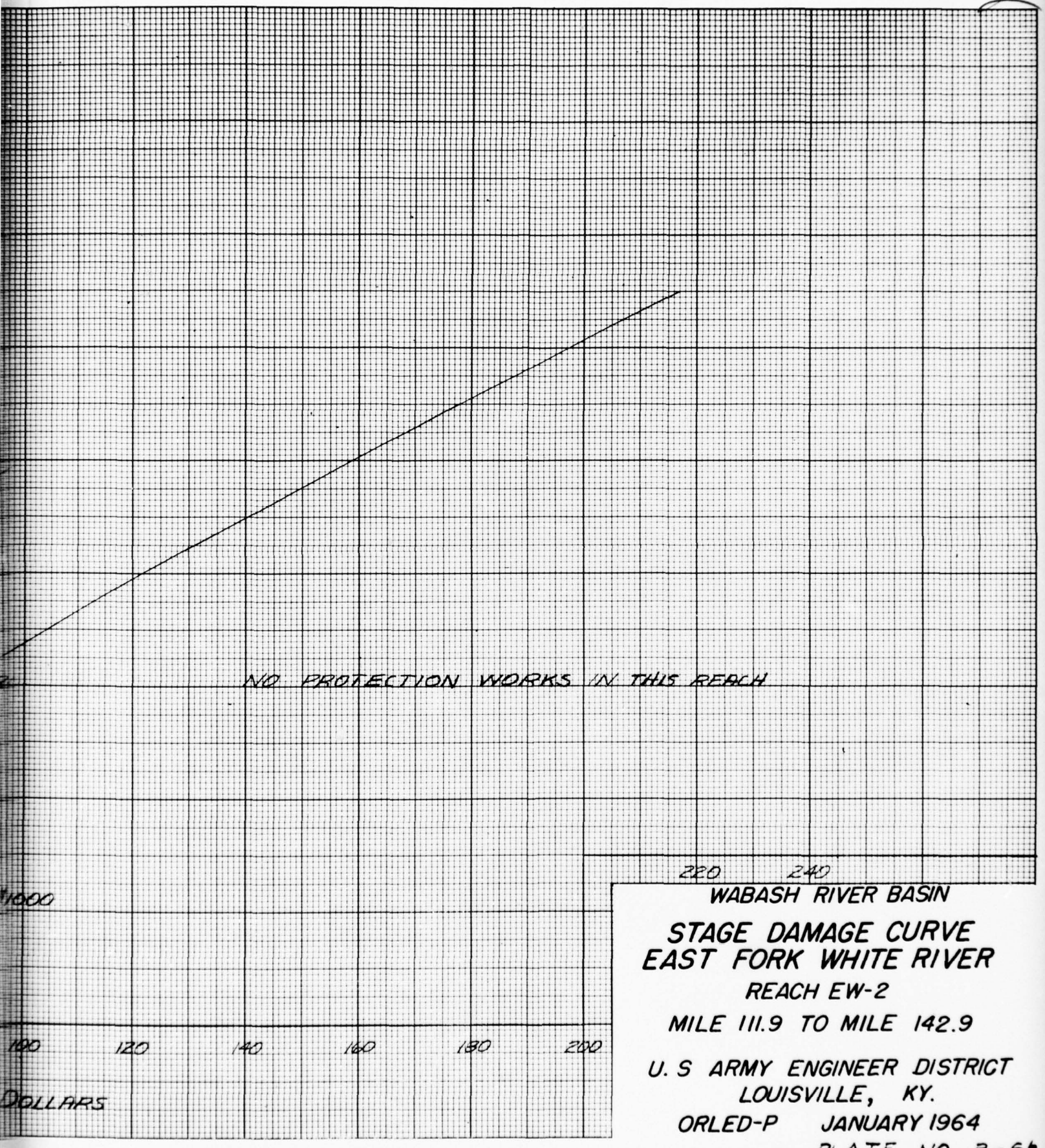
MILE 51.6 TO MILE 111.9

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-6


STAGE IN FEET - SHOALS GAGE
44
40
36
32
28
24
20
16
0
20
40
60
80
100
120
140
DAMAGE IN THOUSAND DOLLARS
ZERO DAMAGE
#1000
NO



WABASH RIVER BASIN

STAGE DAMAGE CURVE EAST FORK WHITE RIVER

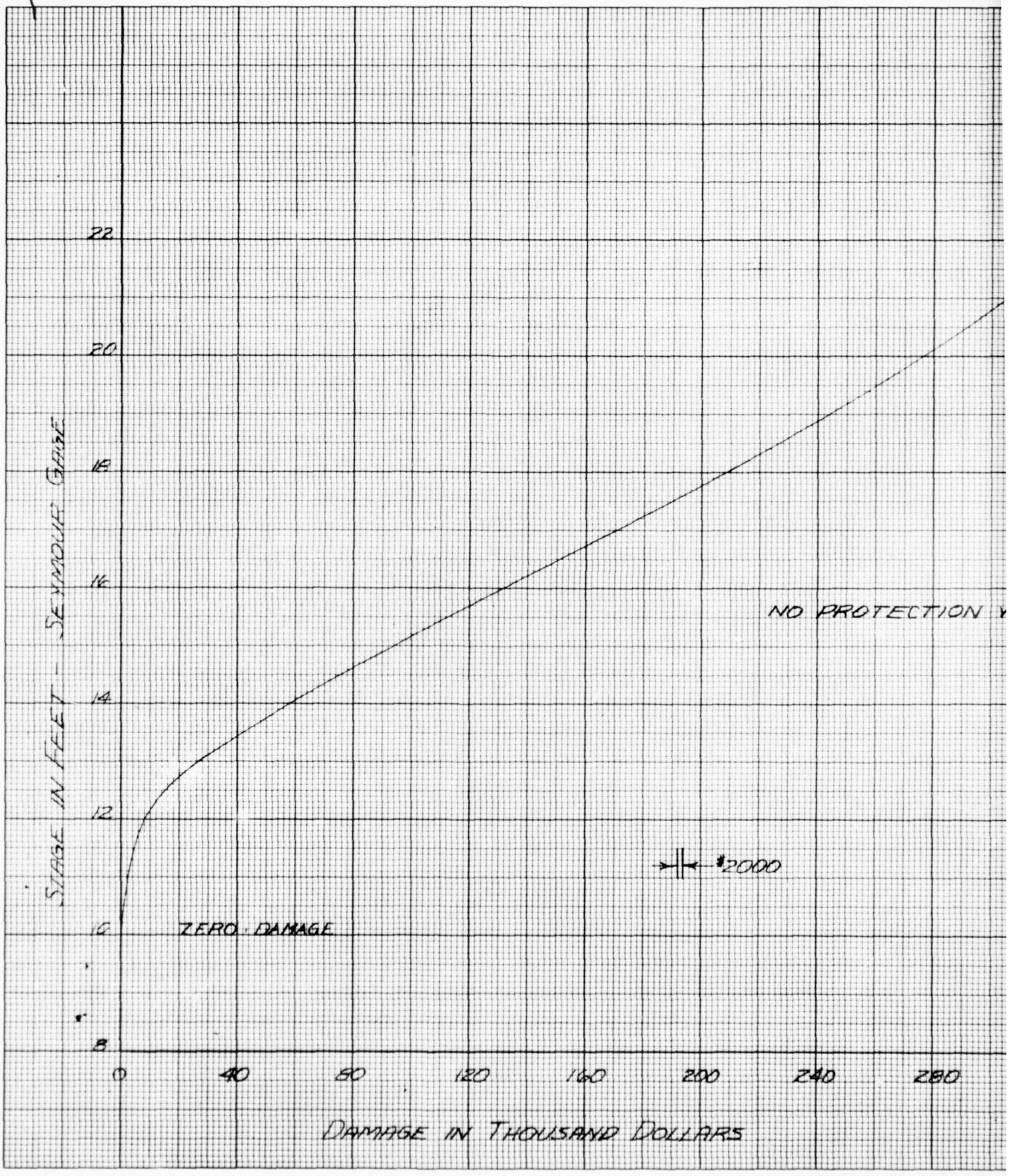
REACH EW-2

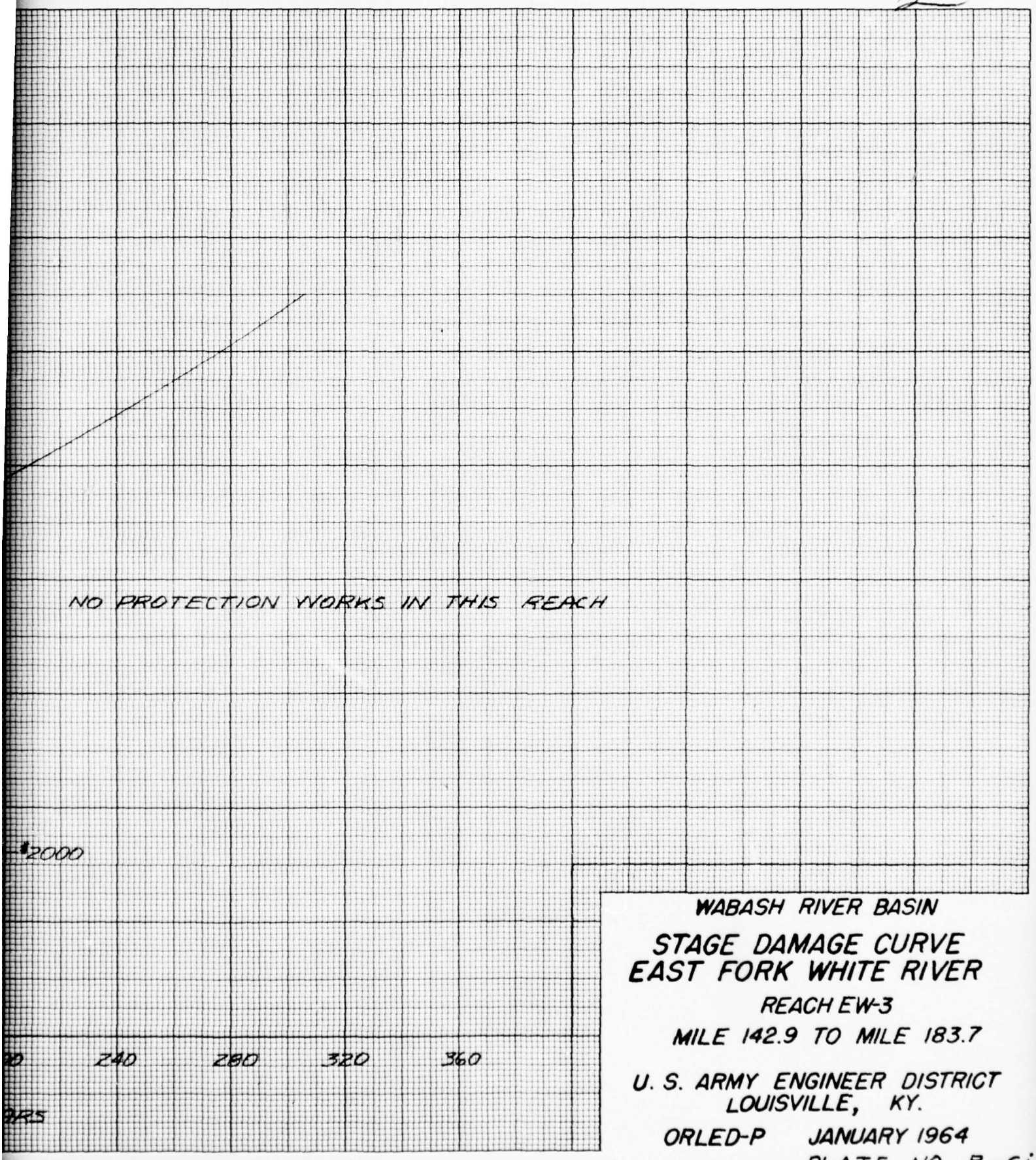
MILE 111.9 TO MILE 142.9

U. S ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. 3-6h


STAGE IN FEET - SEYMOUR GAUGE
22
20
18
16
14
12
10
8
NO PROTECTION
$2000
ZERO DAMAGE
0
40
80
120
160
200
240
280
DAMAGE IN THOUSAND DOLLARS



WABASH RIVER BASIN

STAGE DAMAGE CURVE
EAST FORK WHITE RIVER

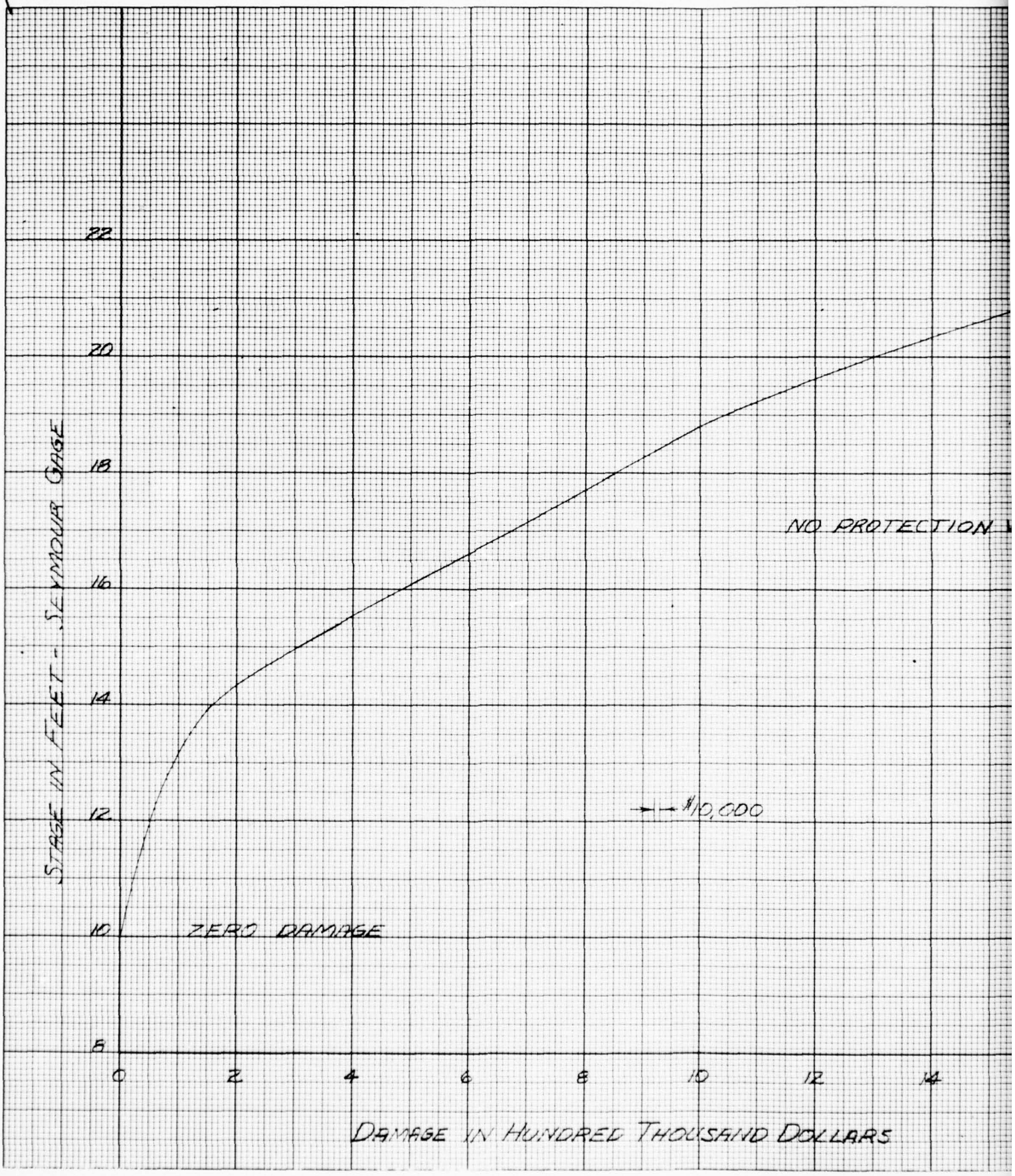
REACH EW-3

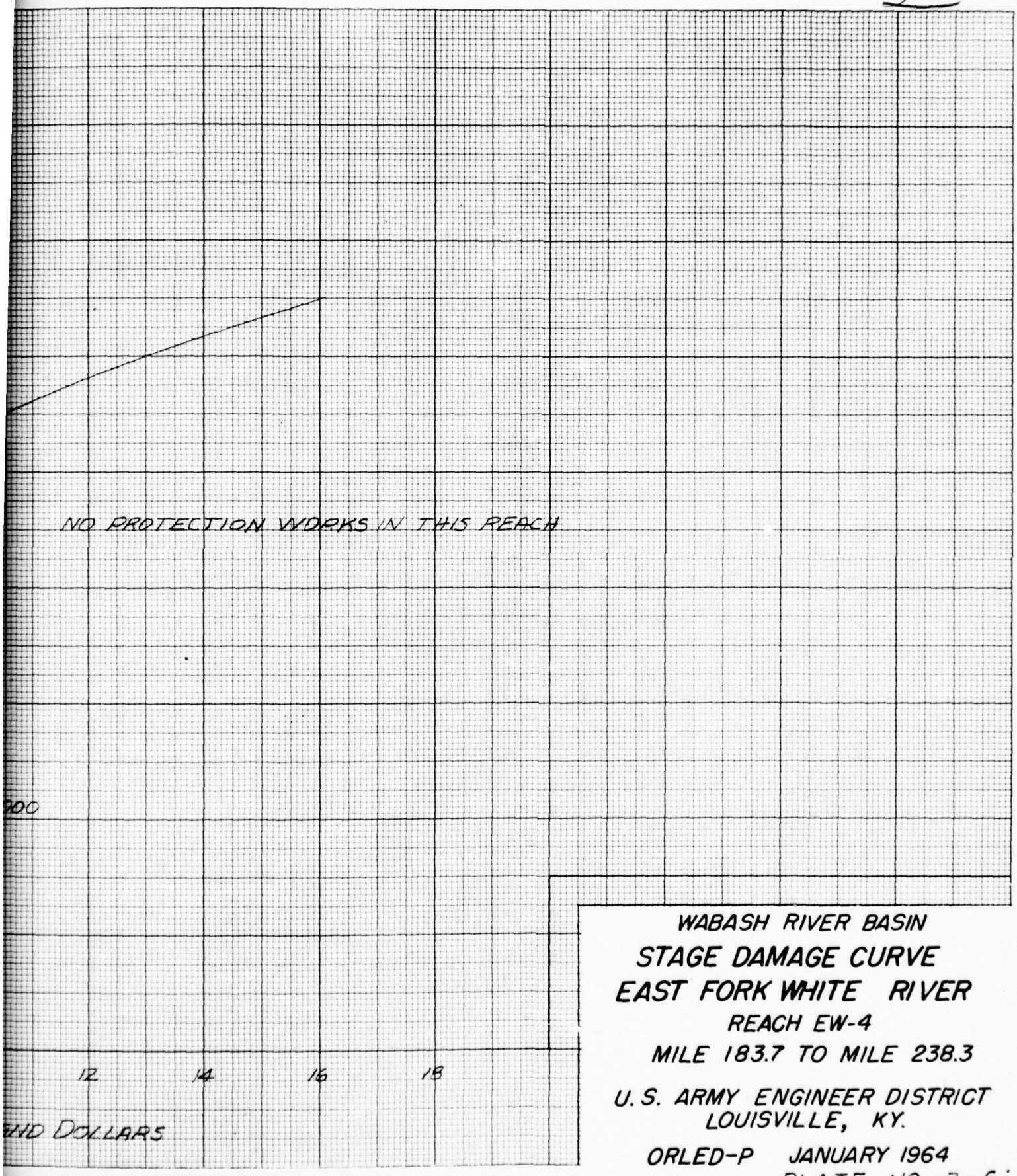
MILE 142.9 TO MILE 183.7

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-6i


22
20
18
16
14
12
10
8
0
2
4
6
8
10
12
14
STAGE IN FEET - SEYMOUR GAGE
DAMAGE IN HUNDRED THOUSAND DOLLARS
ZERO DAMAGE
$10,000
NO PROTECTION



WABASH RIVER BASIN

STAGE DAMAGE CURVE
EAST FORK WHITE RIVER

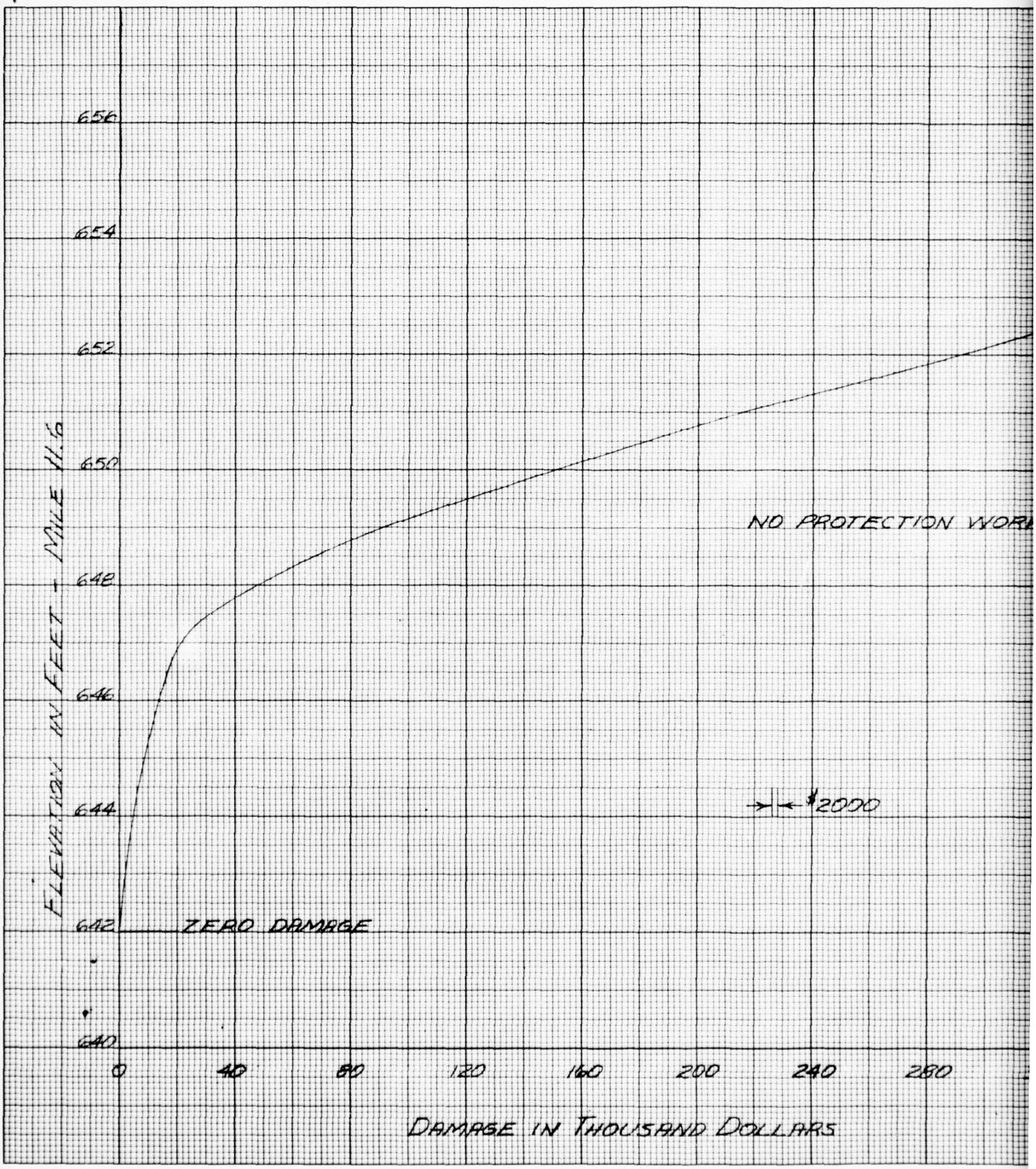
REACH EW-4

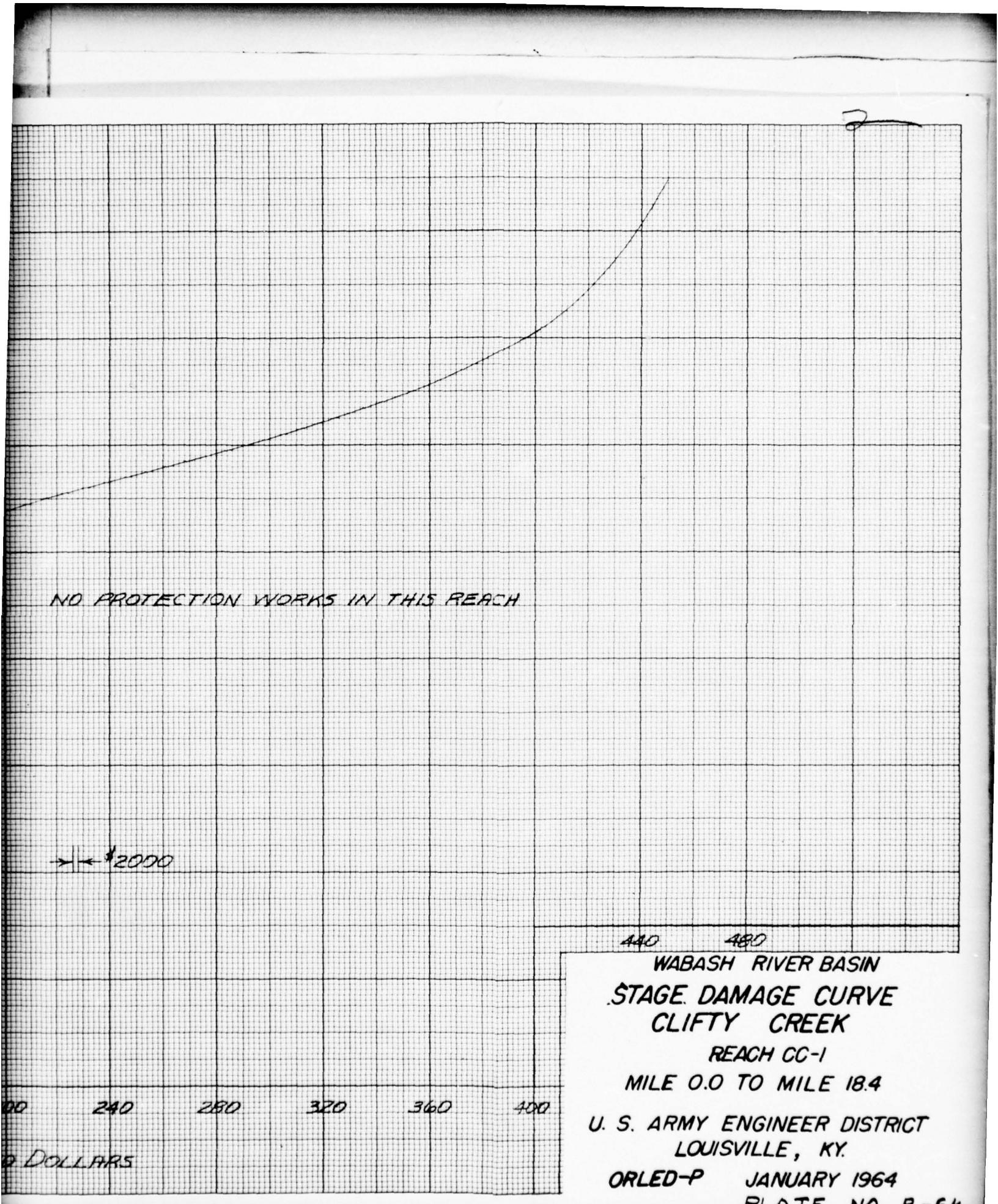
MILE 183.7 TO MILE 238.3

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. 3-6j


656
654
652
650
648
646
644
642
640
ELEVATION IN FEET - MILE 11.6
NO PROTECTION WORK
$2000
ZERO DAMAGE
0
40
80
120
160
200
240
280
DAMAGE IN THOUSAND DOLLARS



WABASH RIVER BASIN

STAGE DAMAGE CURVE

CLIFTY CREEK

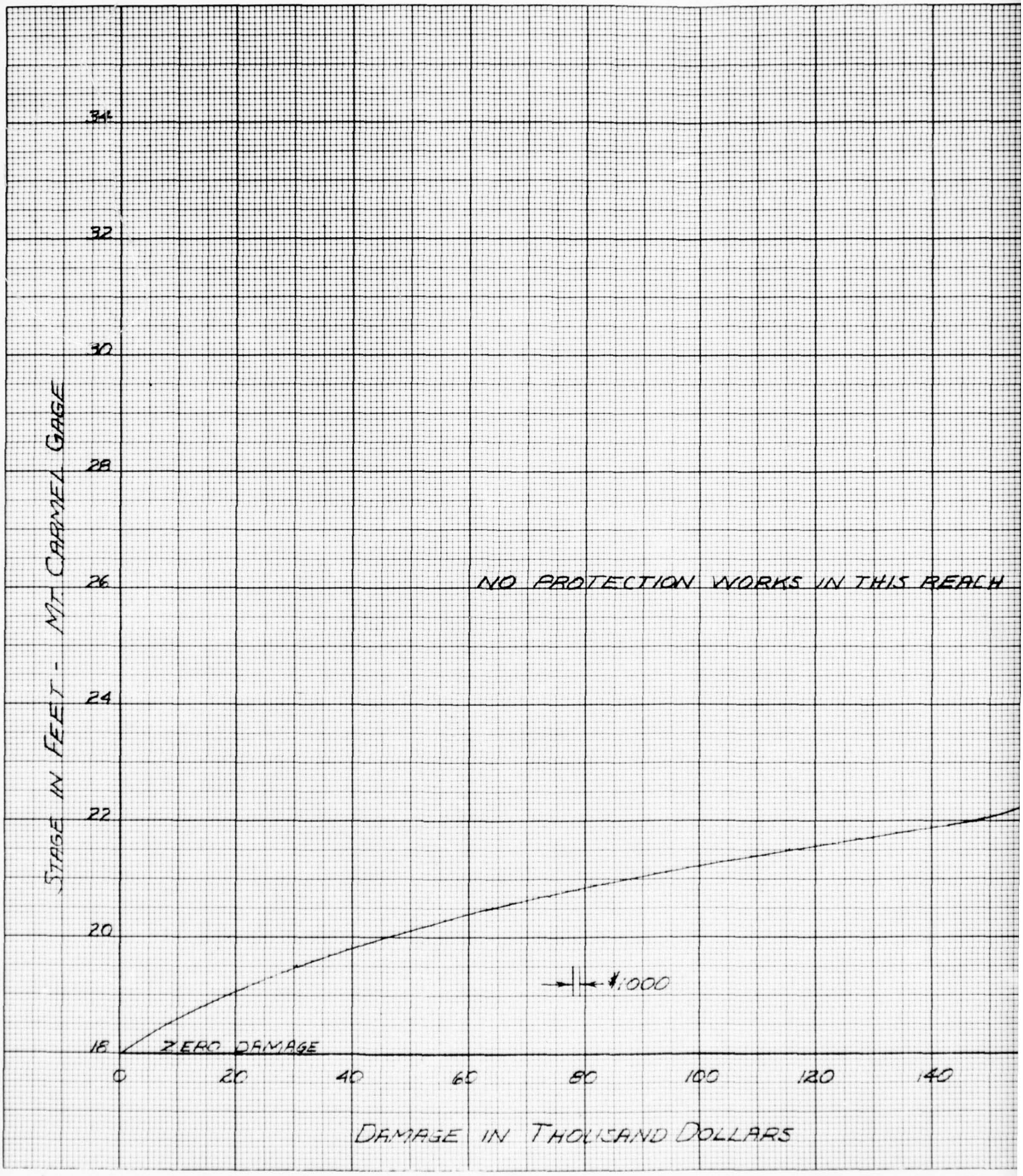
REACH CC-1

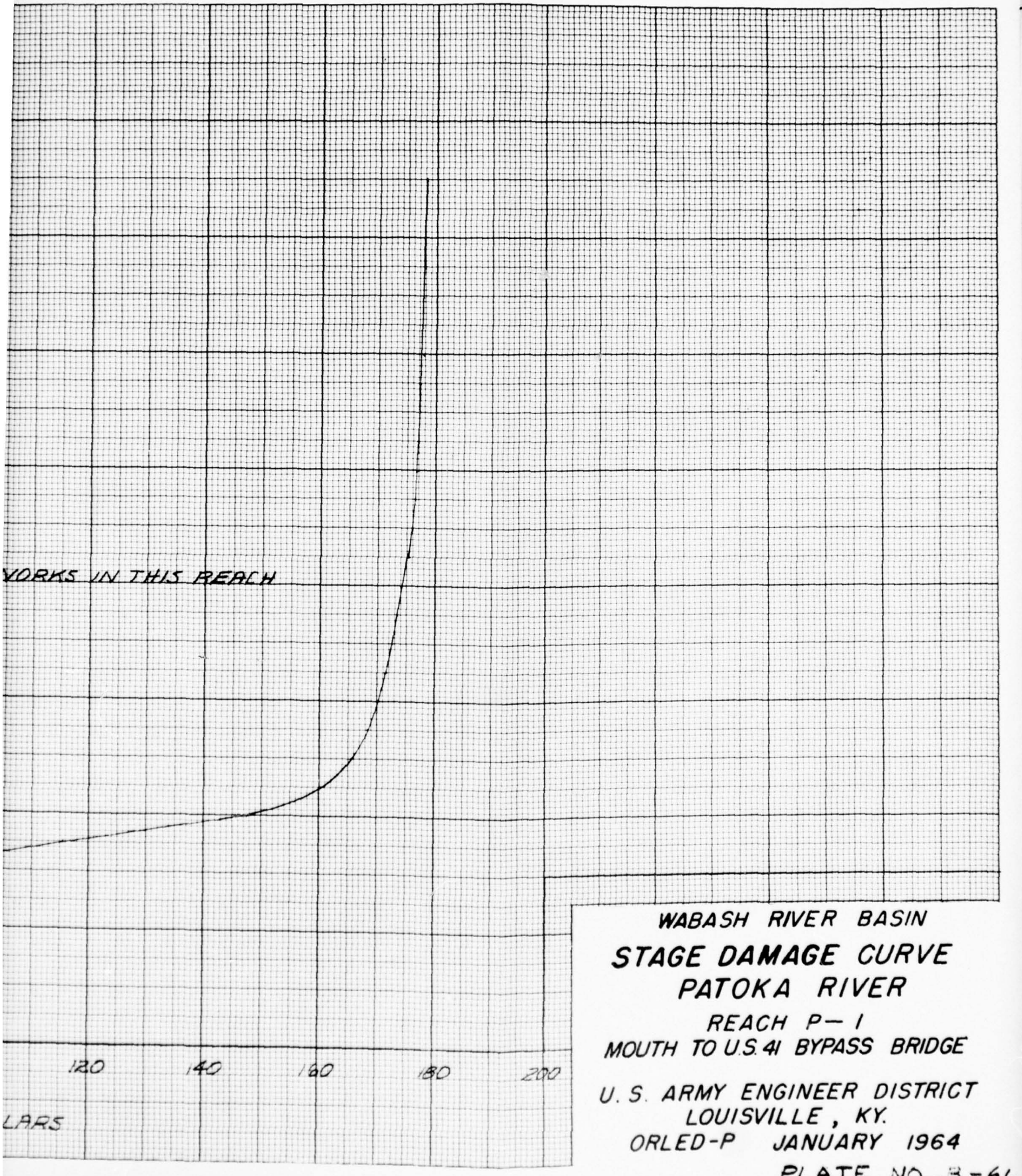
MILE 0.0 TO MILE 18.4

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-6k


STAGE IN FEET - MT CARMEL GAGE
34
32
30
28
26
24
22
20
18
NO PROTECTION WORKS IN THIS REACH
$1,000
ZERO DAMAGE
0
20
40
60
80
100
120
140
DAMAGE IN THOUSAND DOLLARS



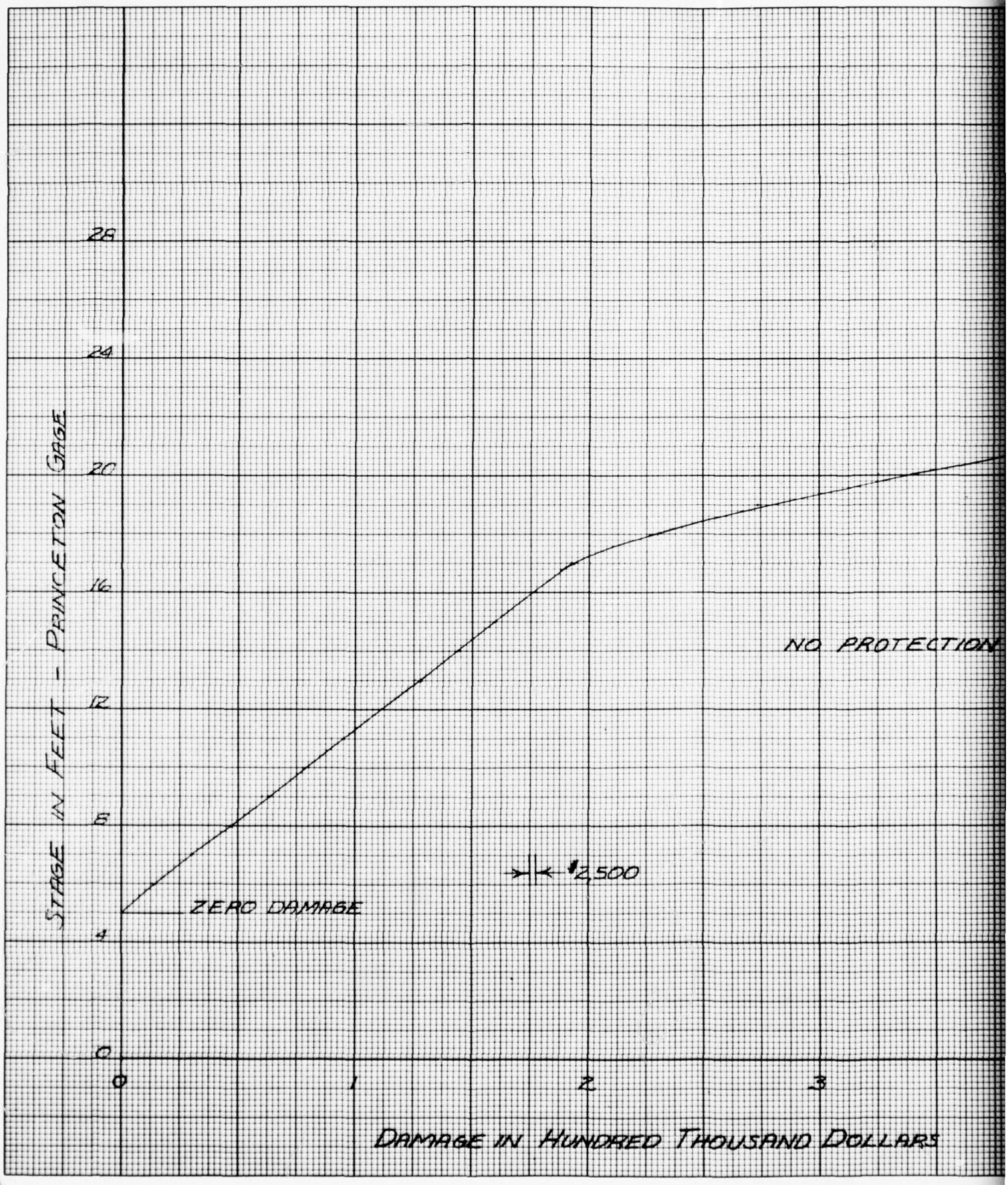
WABASH RIVER BASIN

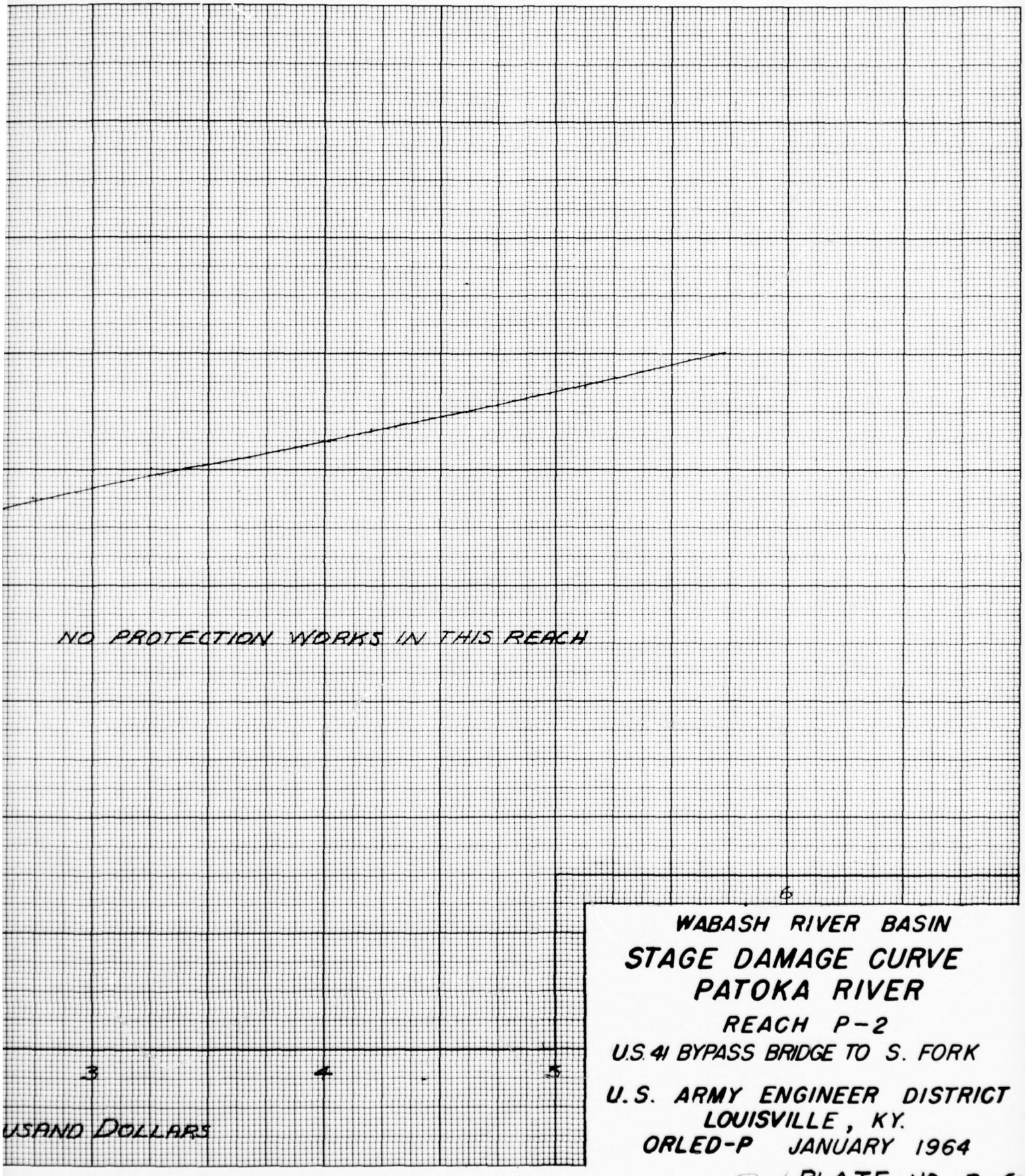
STAGE DAMAGE CURVE
PATOKA RIVER

REACH P – 1
MOUTH TO U.S. 41 BYPASS BRIDGE

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. 2 B-6L


STAGE IN FEET - PRINCETON GAGE
28
24
20
16
12
8
4
0
0
1
2
3
DAMAGE IN HUNDRED THOUSAND DOLLARS
NO PROTECTION
ZERO DAMAGE
$2,500



WABASH RIVER BASIN

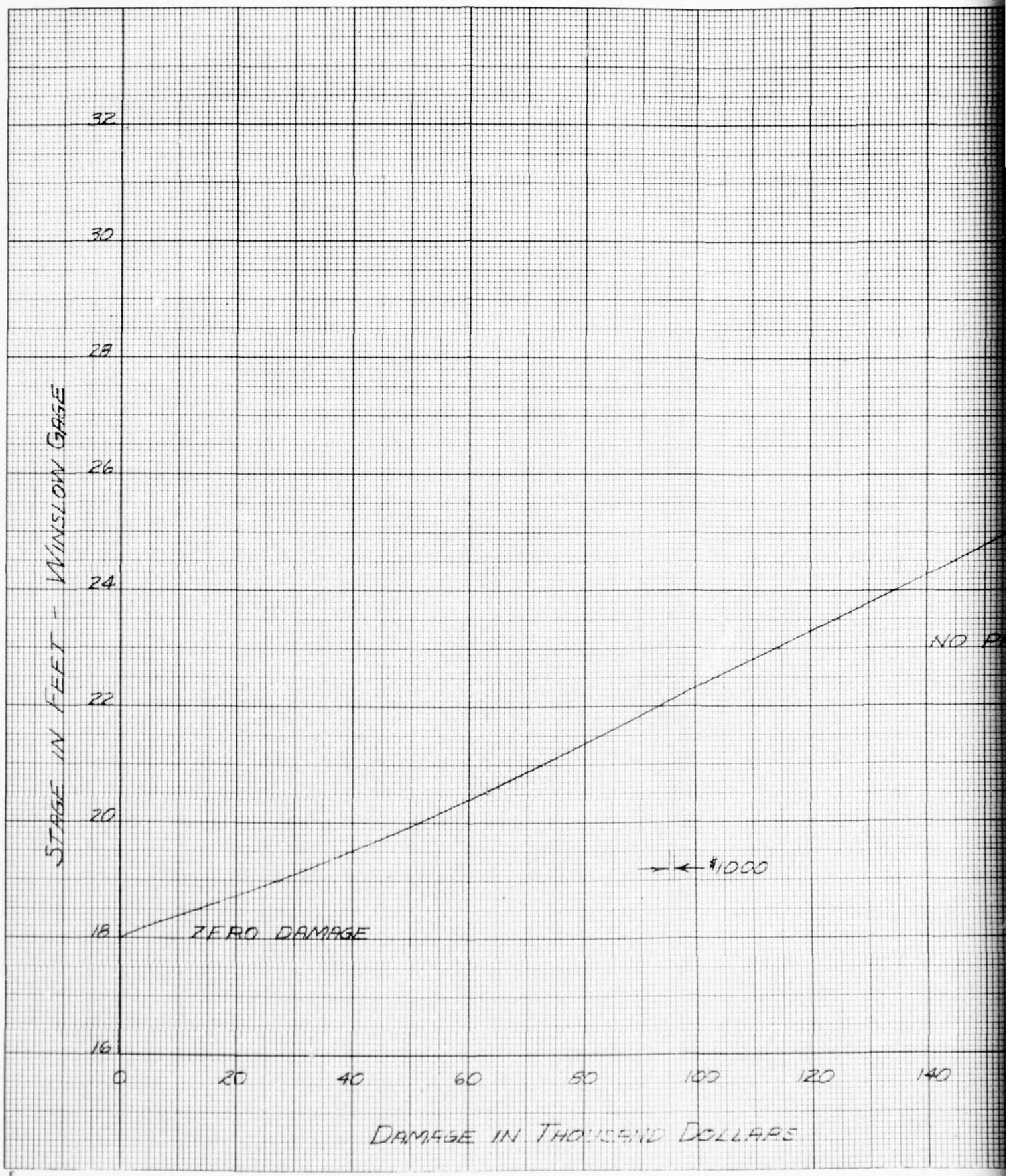
STAGE DAMAGE CURVE
PATOKA RIVER

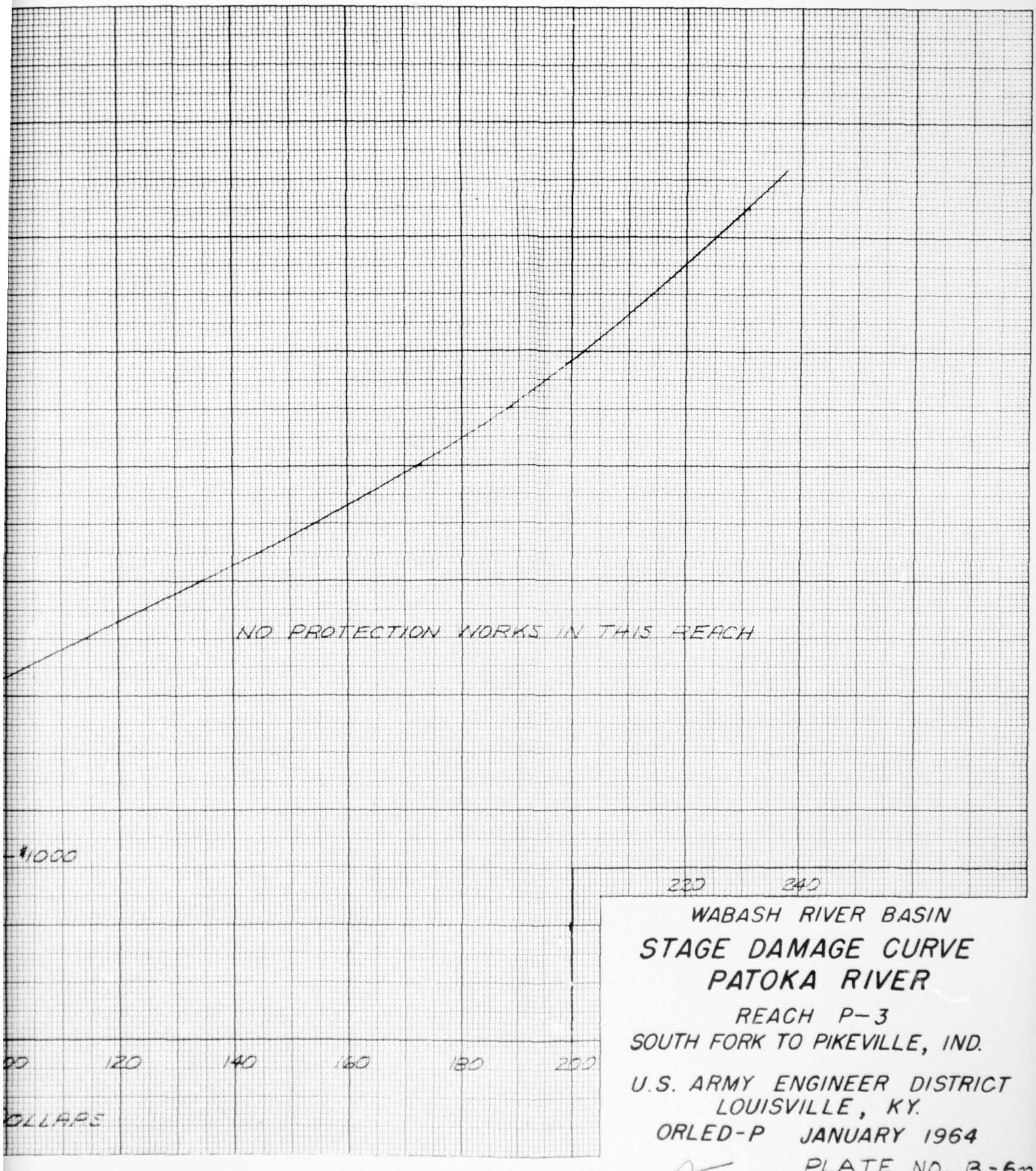
REACH P-2

U.S. 41 BYPASS BRIDGE TO S. FORK

U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6m


32
30
28
26
24
22
20
18
16
STAGE IN FEET - WINSLOW GAGE
ZERO DAMAGE
$1000
NO D
0
20
40
60
80
100
120
140
DAMAGE IN THOUSAND DOLLARS



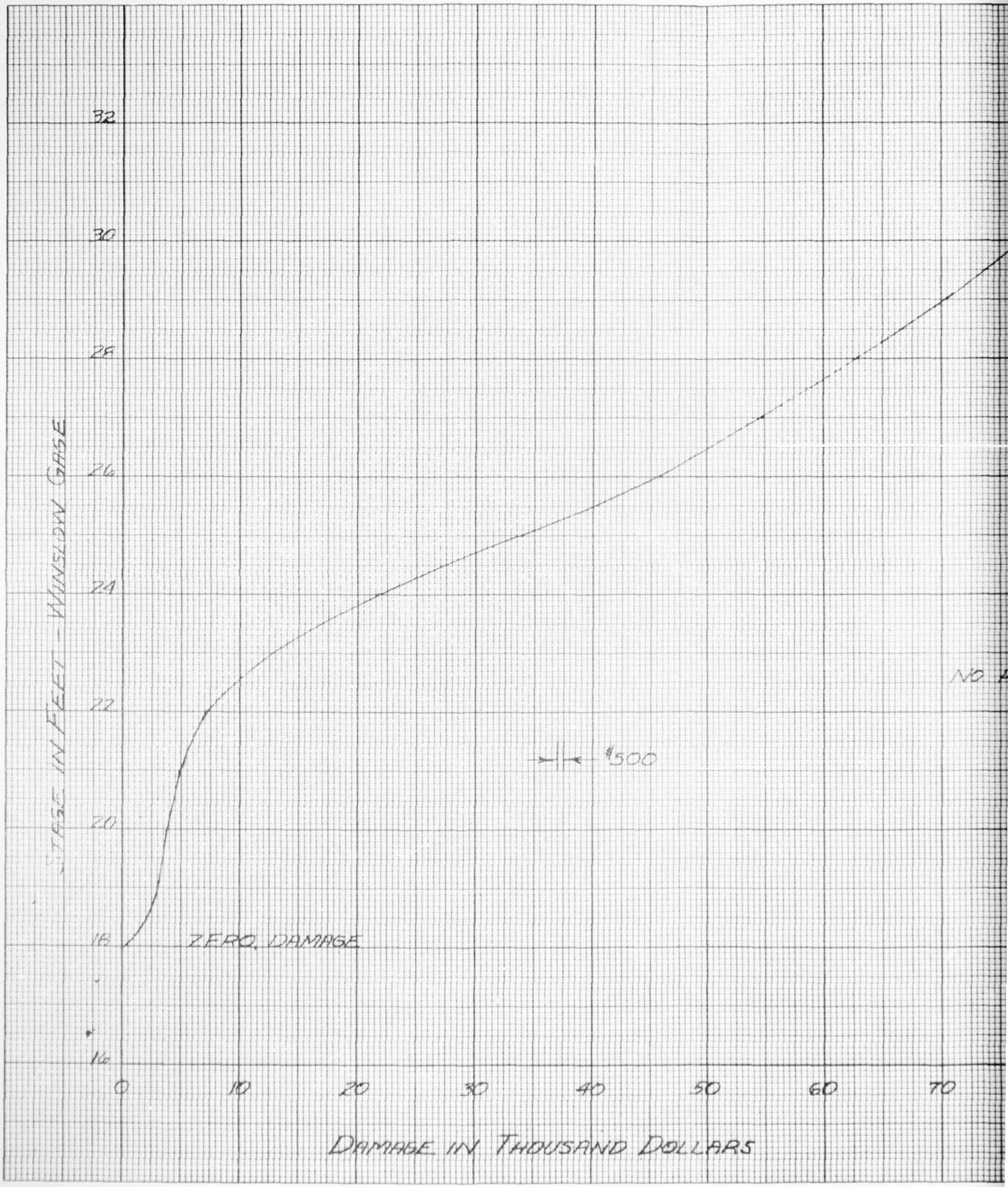
WABASH RIVER BASIN

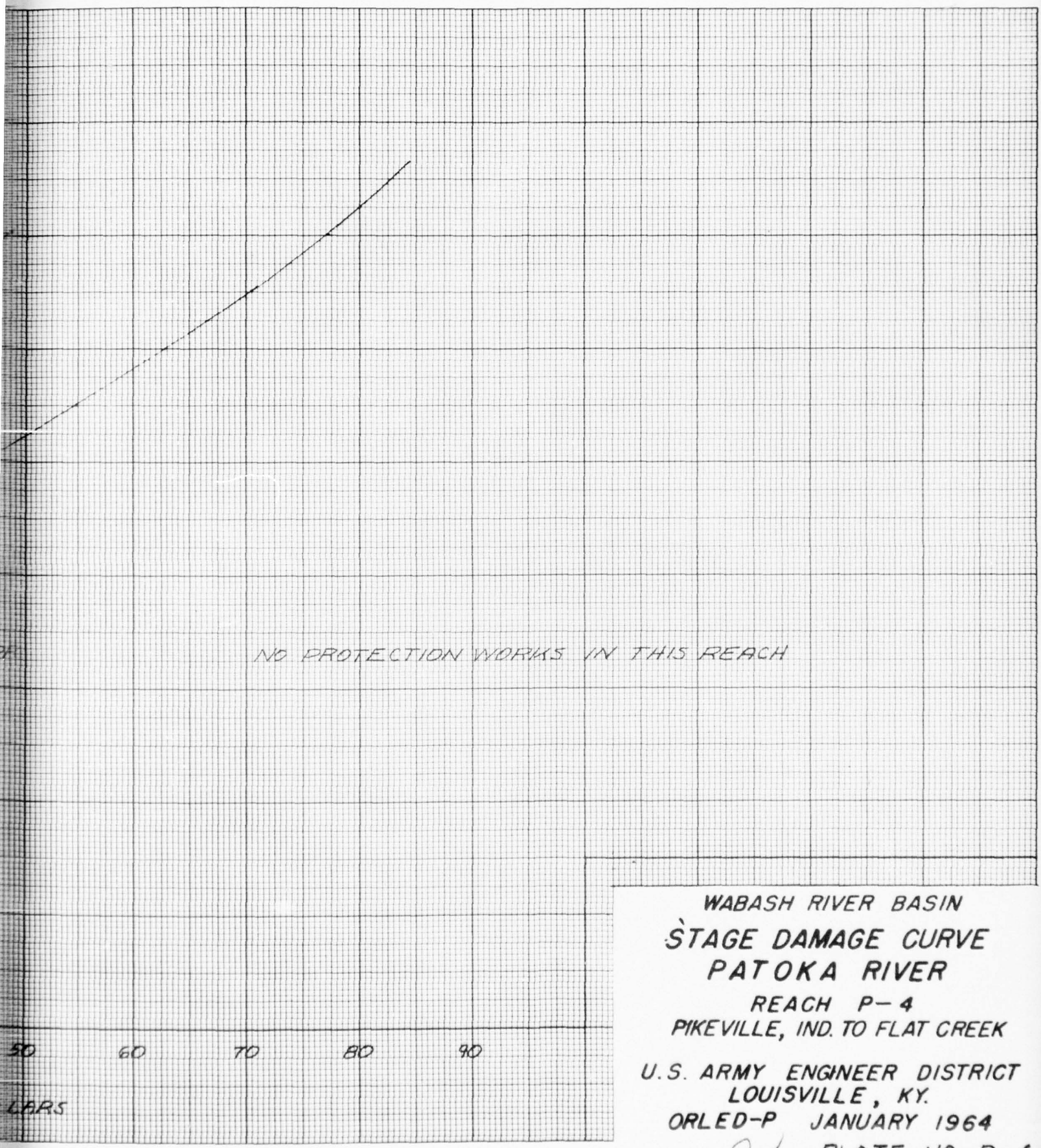
STAGE DAMAGE CURVE
PATOKA RIVER

REACH P-3
SOUTH FORK TO PIKEVILLE, IND.

U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6n


32
30
28
26
24
22
20
18
16
STAGE IN FEET - WINSLOW GAGE
ZERO. DAMAGE
$500
0
10
20
30
40
50
60
70
DAMAGE IN THOUSAND DOLLARS



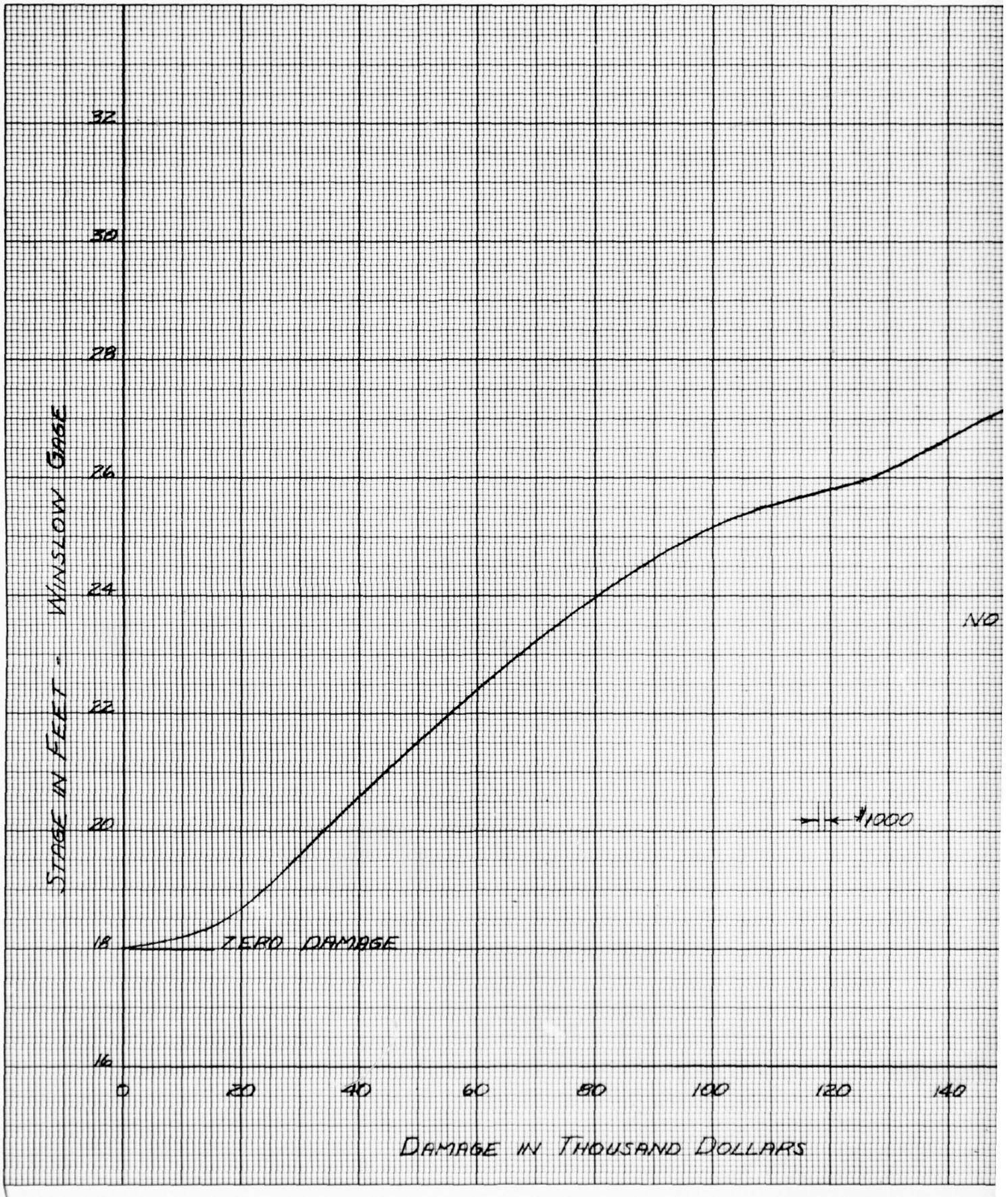
WABASH RIVER BASIN

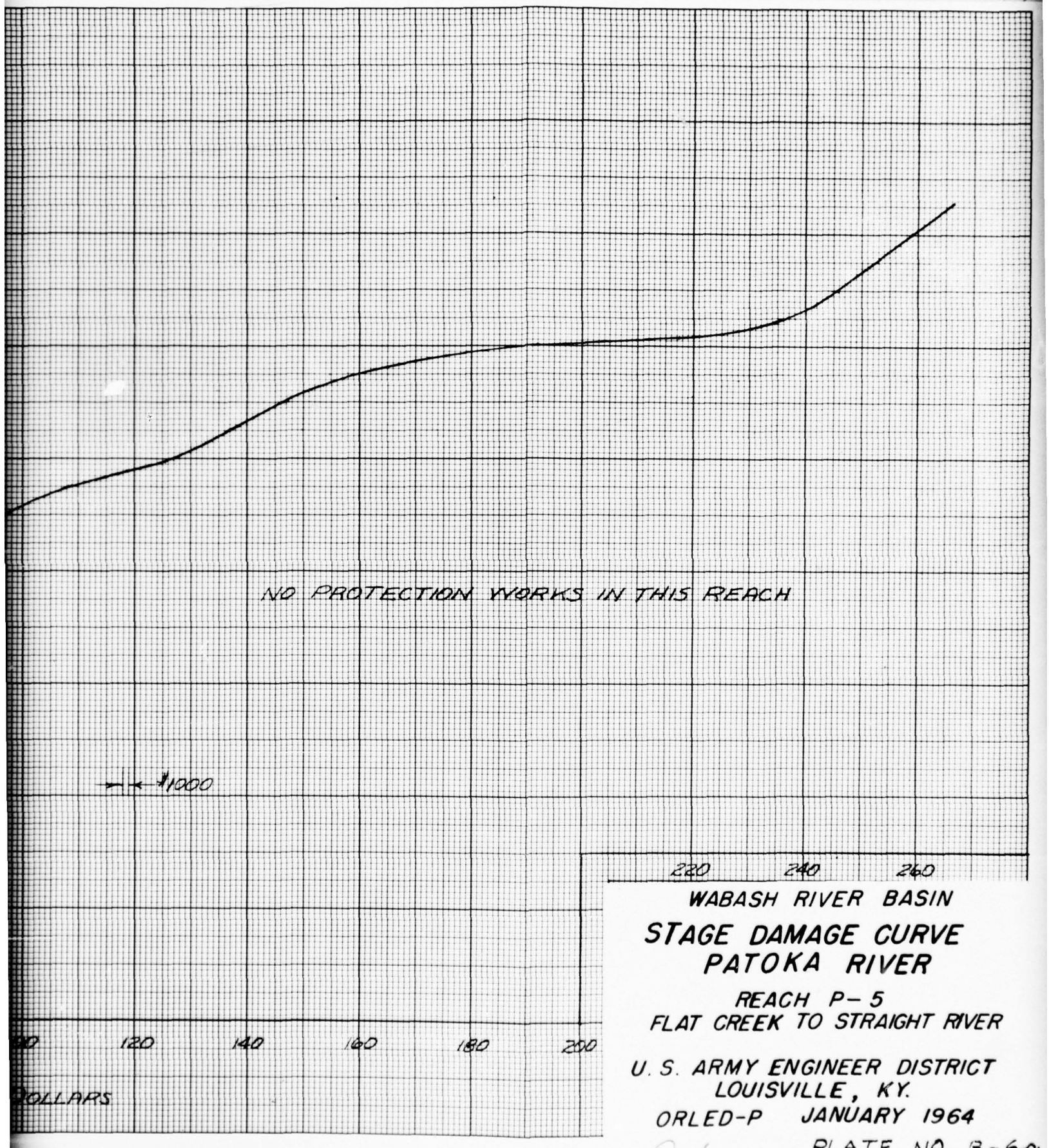
STAGE DAMAGE CURVE
PATOKA RIVER

REACH P-4
PIKEVILLE, IND. TO FLAT CREEK

U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-60


32
30
28
26
24
22
20
18
16
STAGE IN FEET - WINSLOW GAGE
ZERO DAMAGE
NO
#1000
0
20
40
60
80
100
120
140
DAMAGE IN THOUSAND DOLLARS



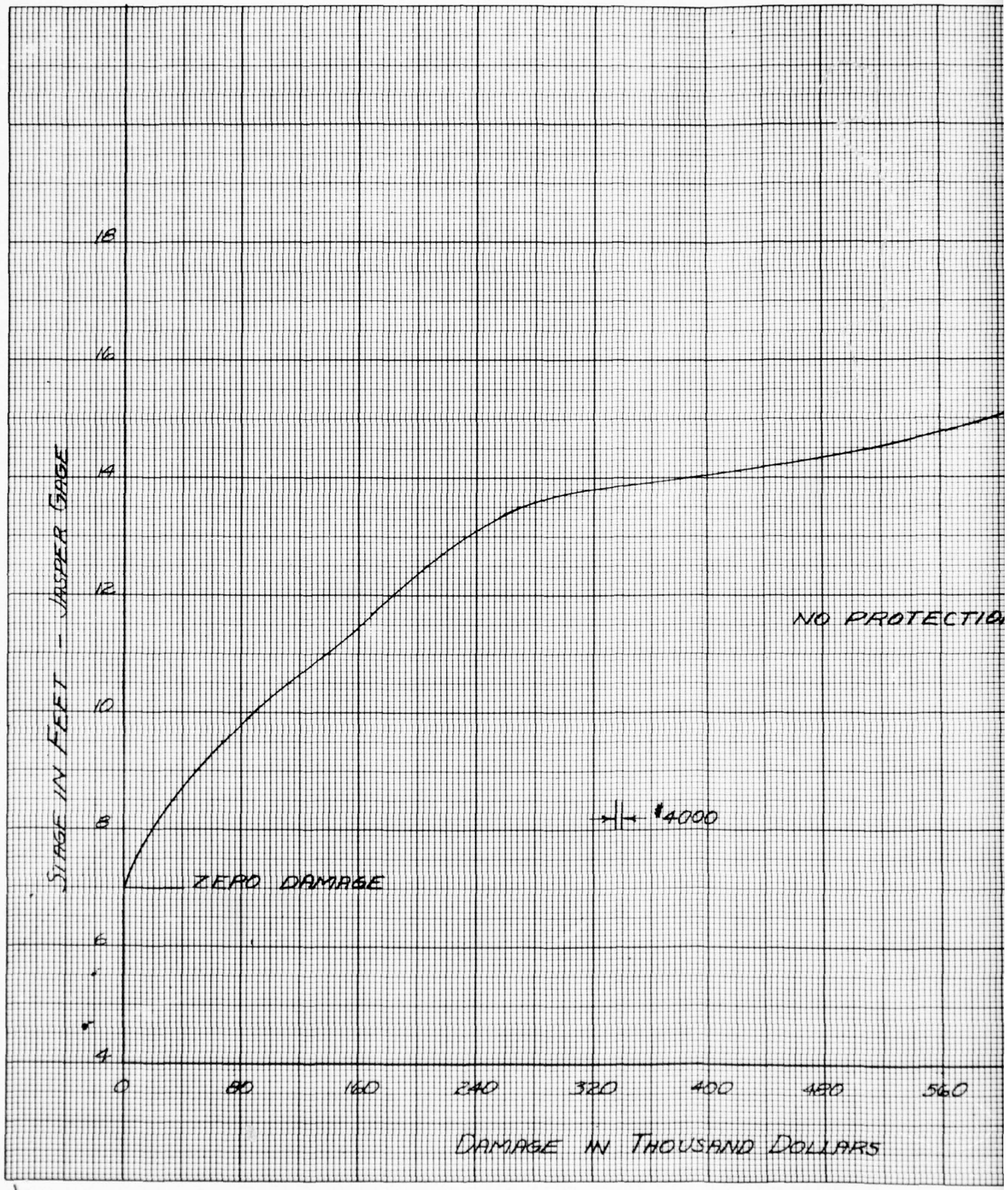
WABASH RIVER BASIN

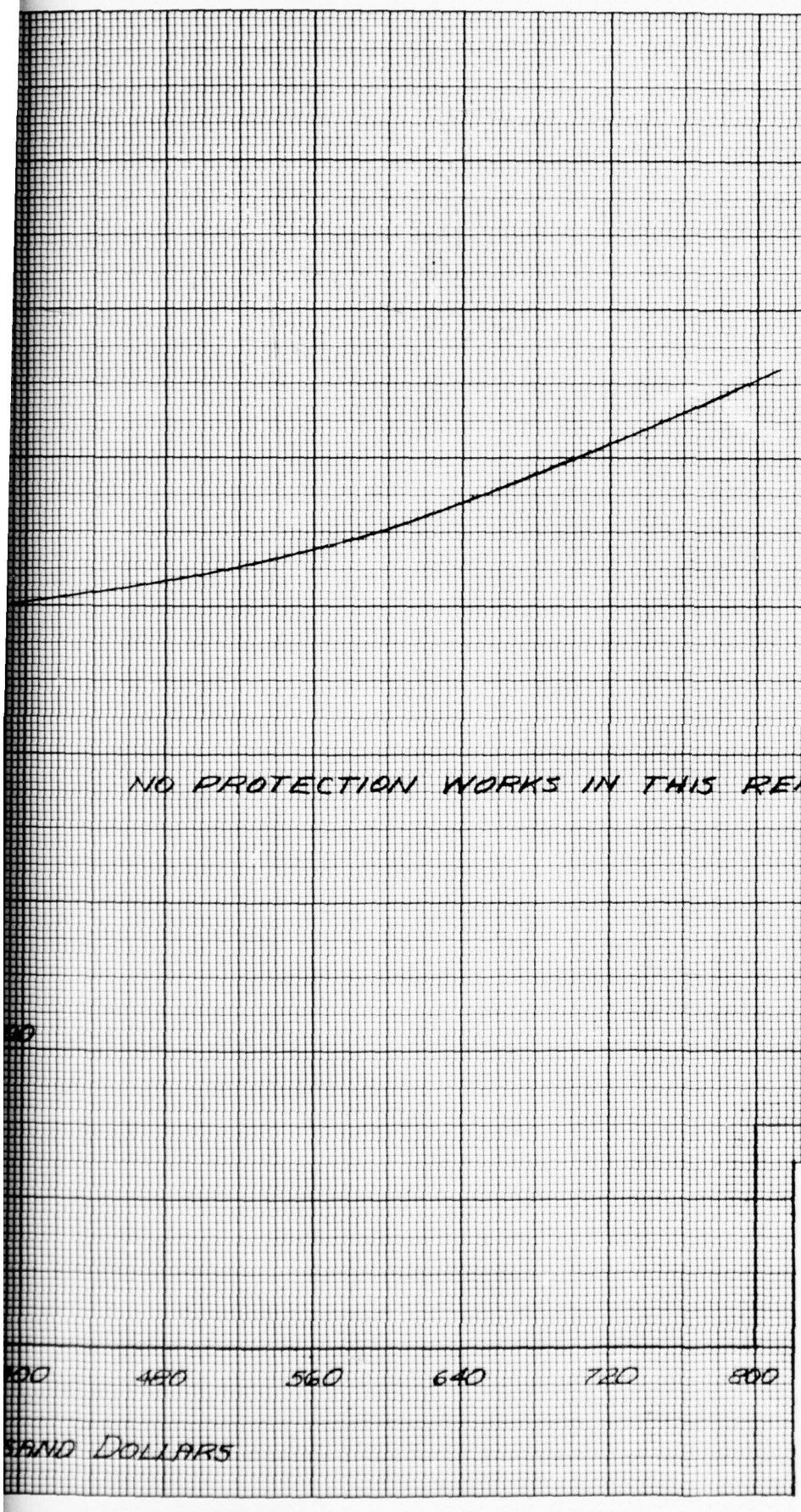
STAGE DAMAGE CURVE
PATOKA RIVER

REACH P-5
FLAT CREEK TO STRAIGHT RIVER

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6p


STAGE IN FEET - JASPER GAGE
18
16
14
12
10
8
6
4
0
80
160
240
320
400
480
560
ZERO DAMAGE
$4000
NO PROTECTIO
DAMAGE IN THOUSAND DOLLARS



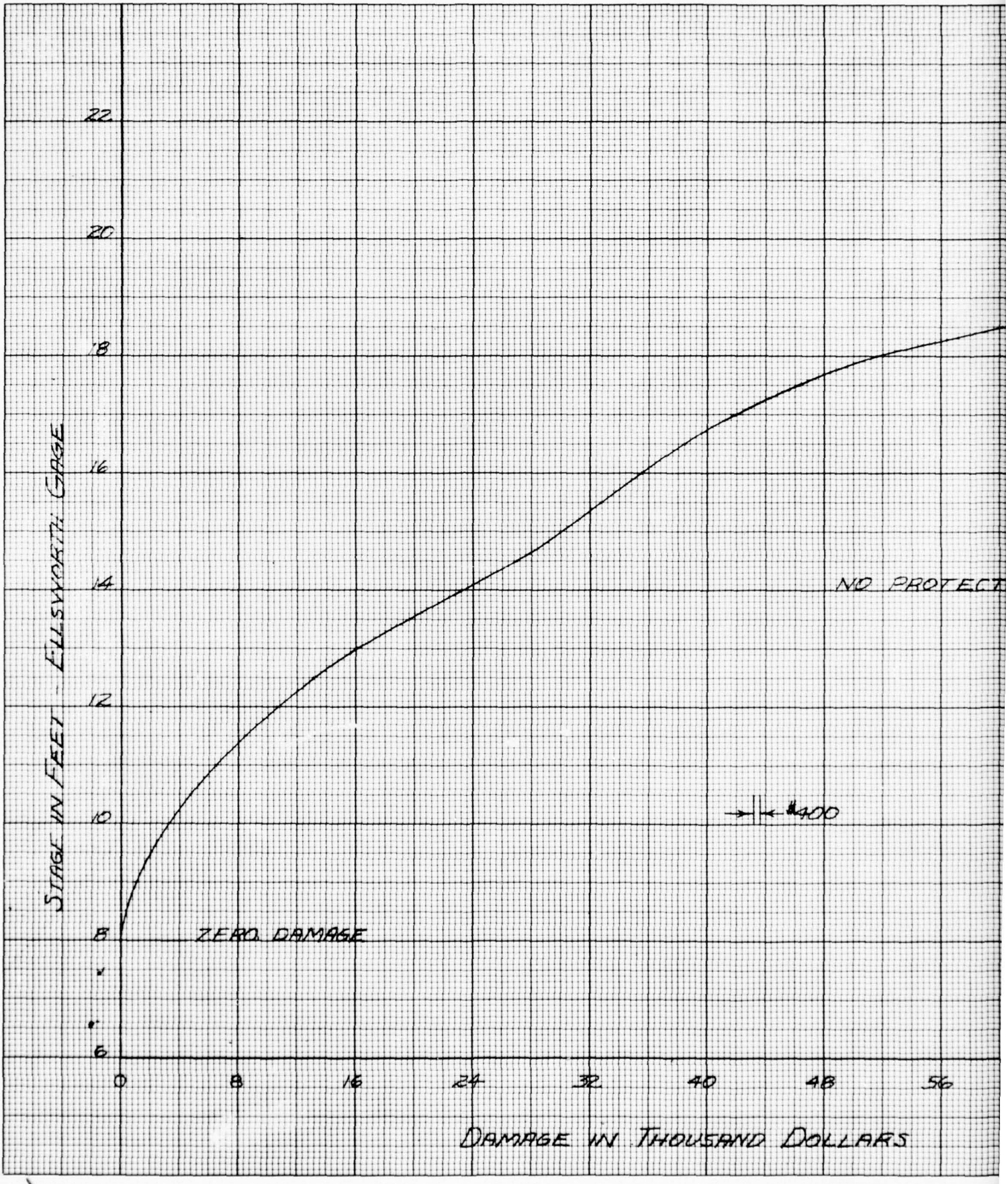
WABASH RIVER BASIN

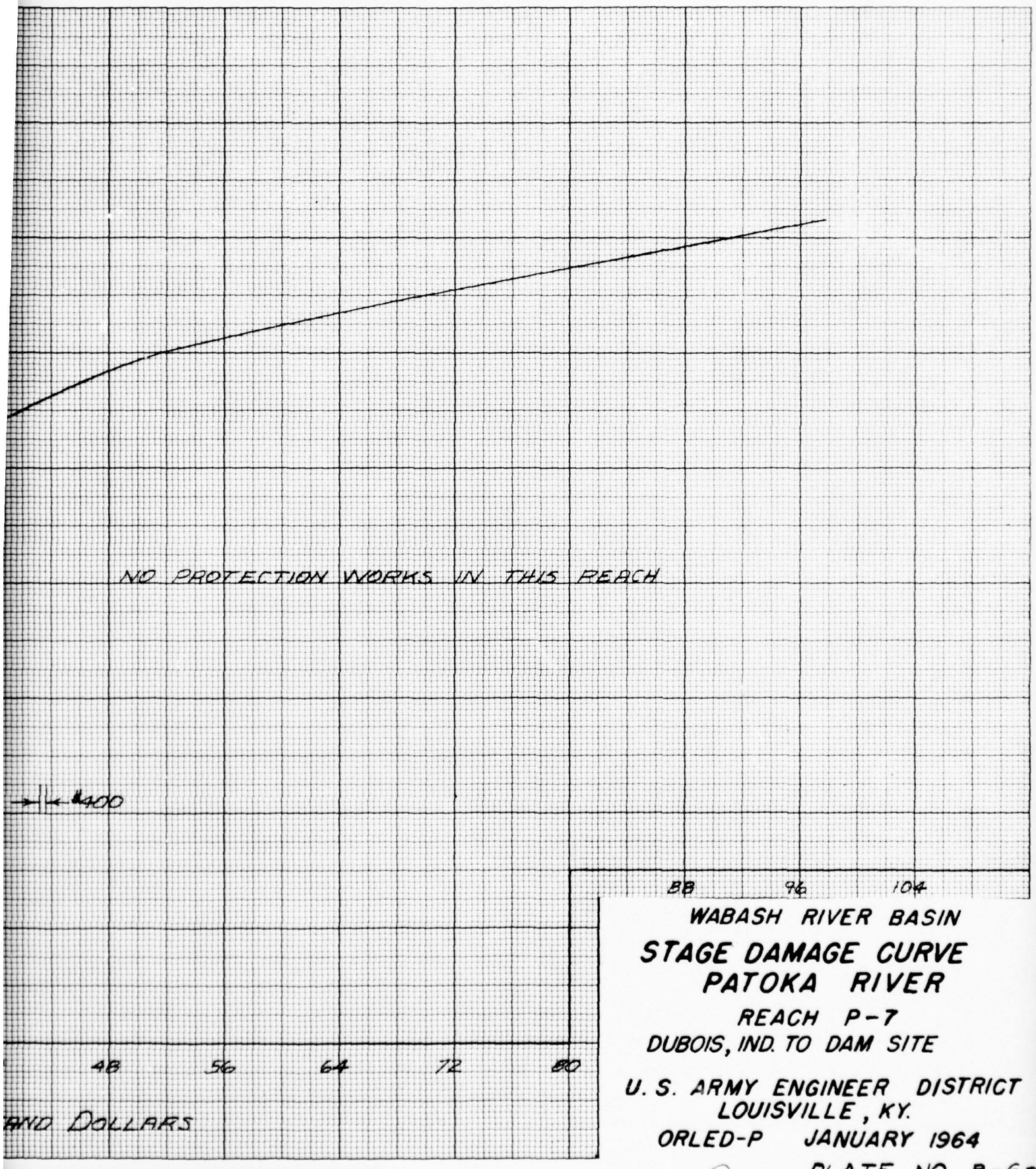
STAGE DAMAGE CURVE
PATOKA RIVER

REACH P-6
STRAIGHT RIVER TO DUBOIS, IND.

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6


22
20
18
16
14
12
10
8
6
STAGE IN FEET - ELLSWORTH GAGE
ZERO DAMAGE
NO PROTECT
400
0
8
16
24
32
40
48
56
DAMAGE IN THOUSAND DOLLARS



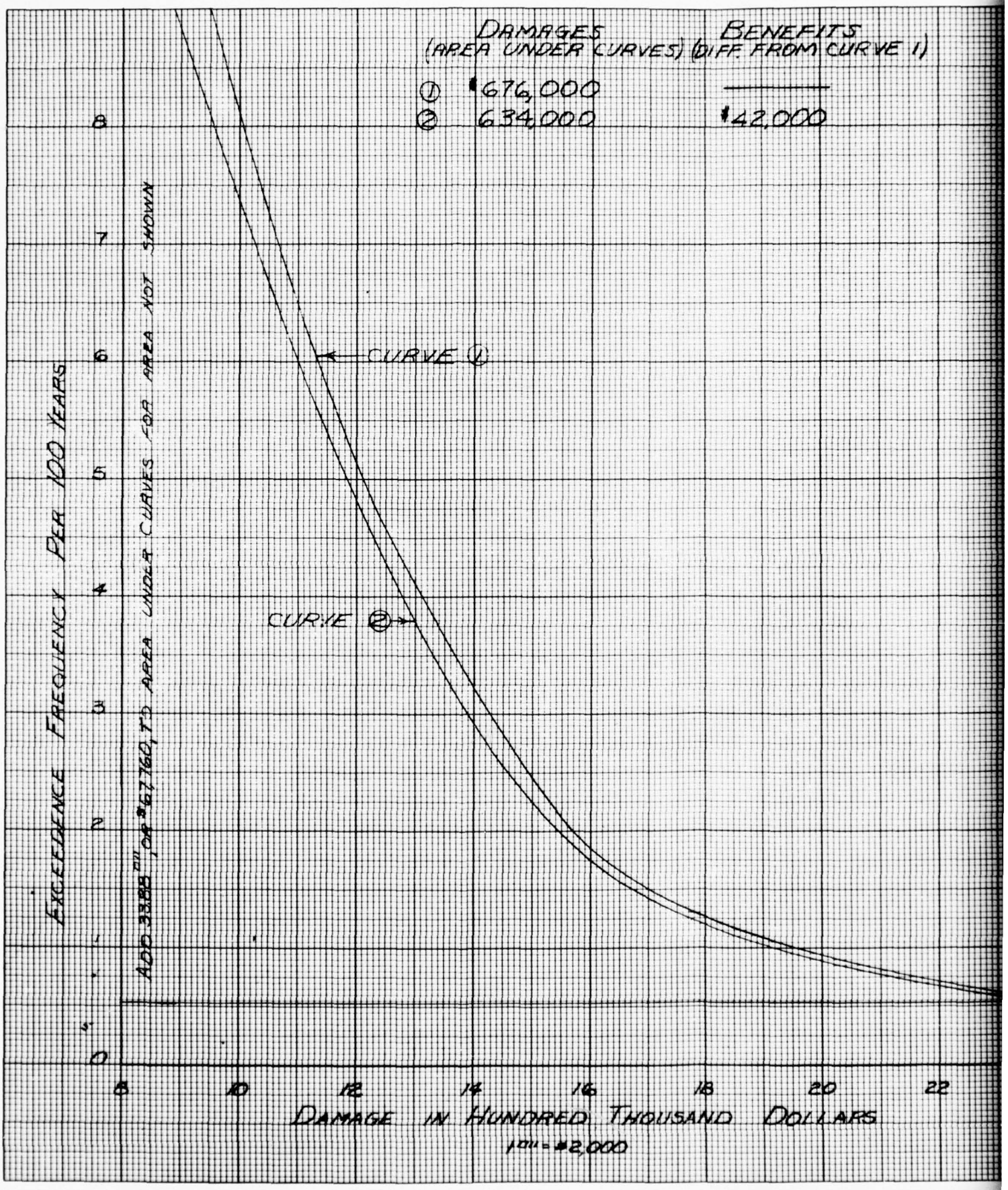
WABASH RIVER BASIN

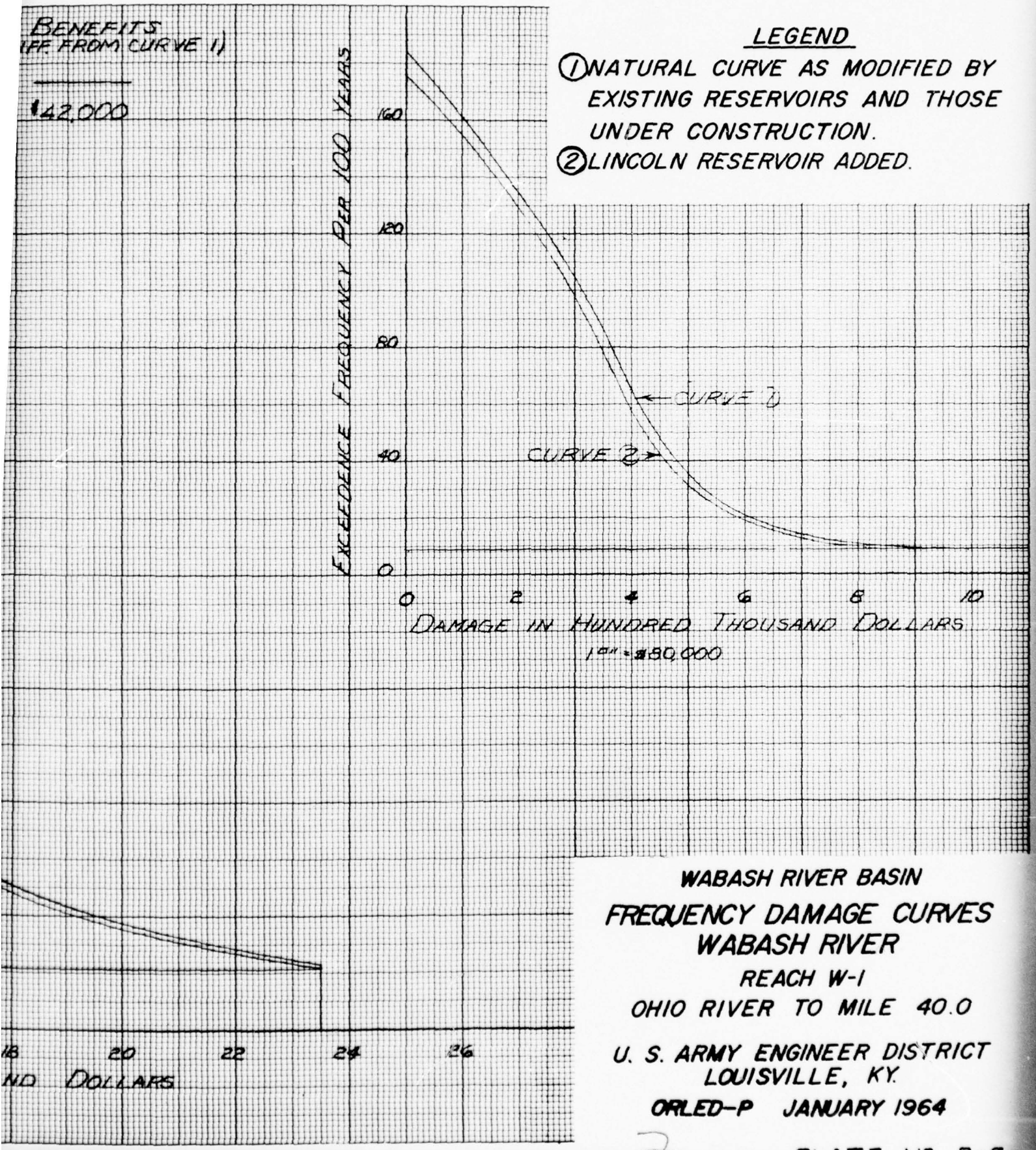
STAGE DAMAGE CURVE
PATOKA RIVER

REACH P-7
DUBOIS, IND. TO DAM SITE

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-6r


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $676,000
② 634,000
$42,000
CURVE ①
CURVE ②
ADD 33.88 SQ. IN. OR $67,760, TO AREA UNDER CURVES FOR AREA NOT SHOWN
EXCEEDENCE FREQUENCY PER 100 YEARS
0
1
2
3
4
5
6
7
8
8
10
12
14
16
18
20
22
DAMAGE IN HUNDRED THOUSAND DOLLARS
1 CM = $2,000



LEGEND

(1) NATURAL CURVE AS MODIFIED BY EXISTING RESERVOIRS AND THOSE UNDER CONSTRUCTION.

(2) LINCOLN RESERVOIR ADDED.

WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES WABASH RIVER

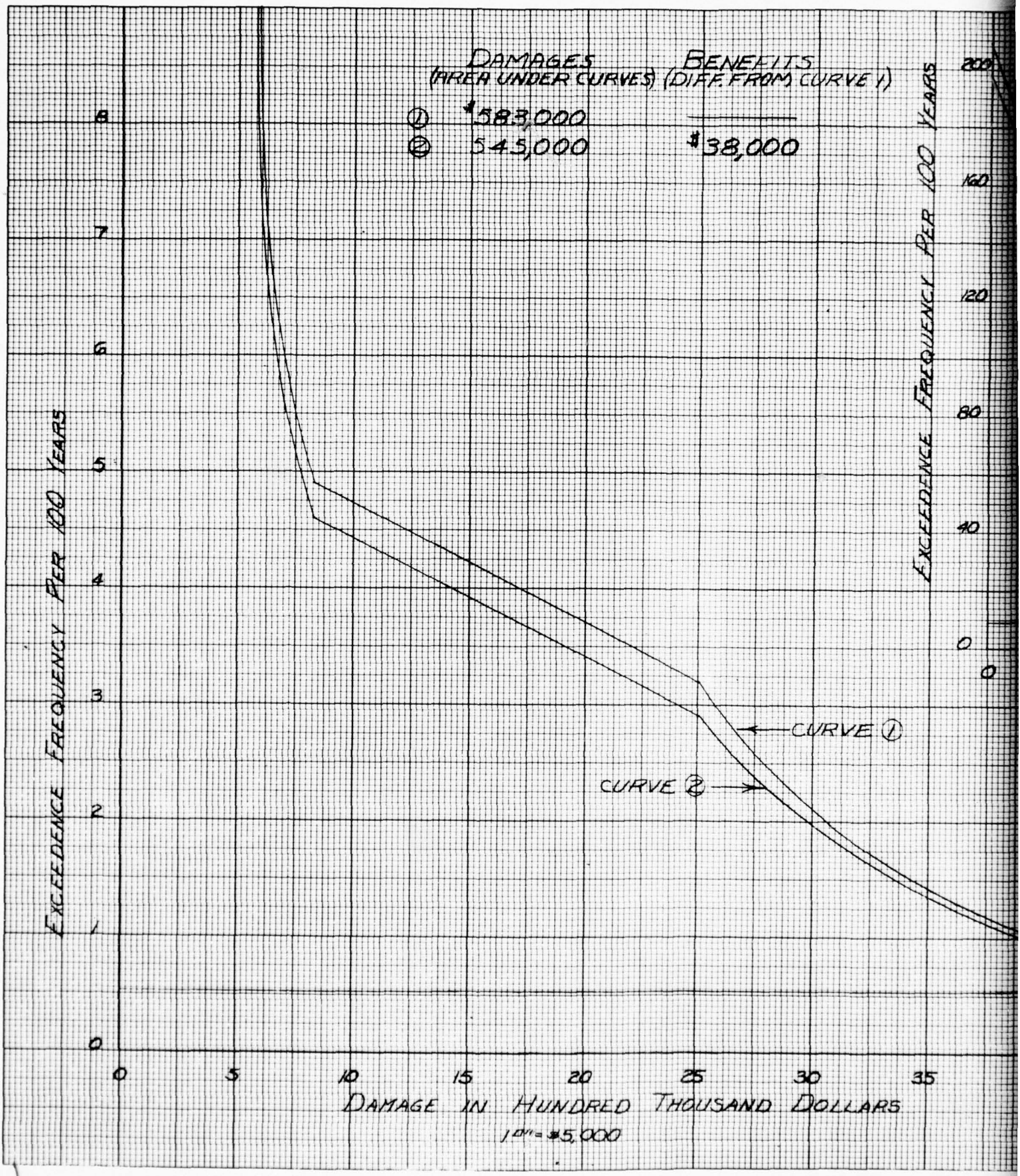
REACH W-1

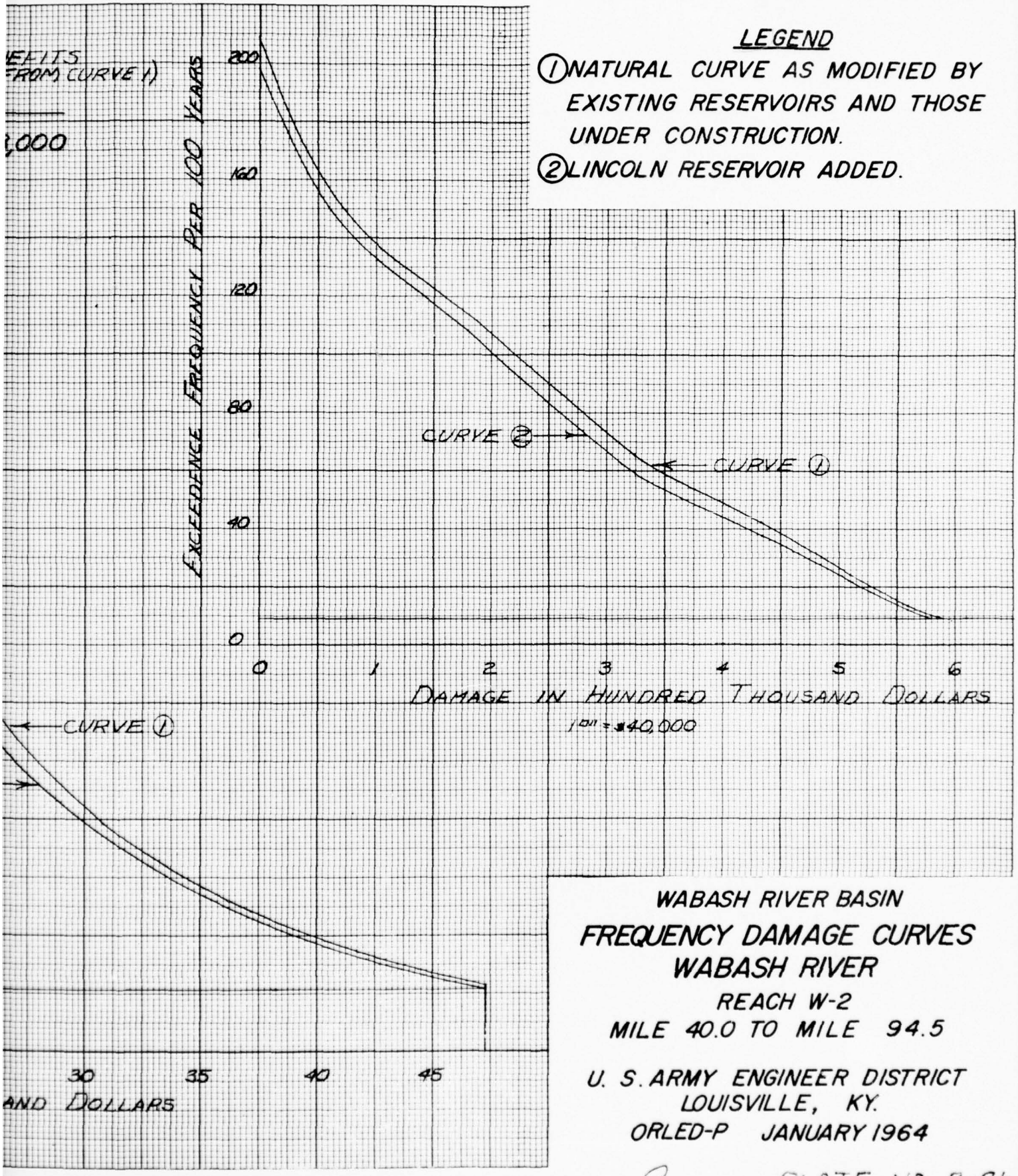
OHIO RIVER TO MILE 40.0

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7a


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $583,000
② 545,000
$38,000
EXCEEDENCE FREQUENCY PER 100 YEARS
EXCEEDENCE FREQUENCY PER 100 YEARS
CURVE ①
CURVE ②
0
1
2
3
4
5
6
7
8
0
40
80
120
160
200
0
5
10
15
20
25
30
35
DAMAGE IN HUNDRED THOUSAND DOLLARS
1" = $5,000



WABASH RIVER BASIN

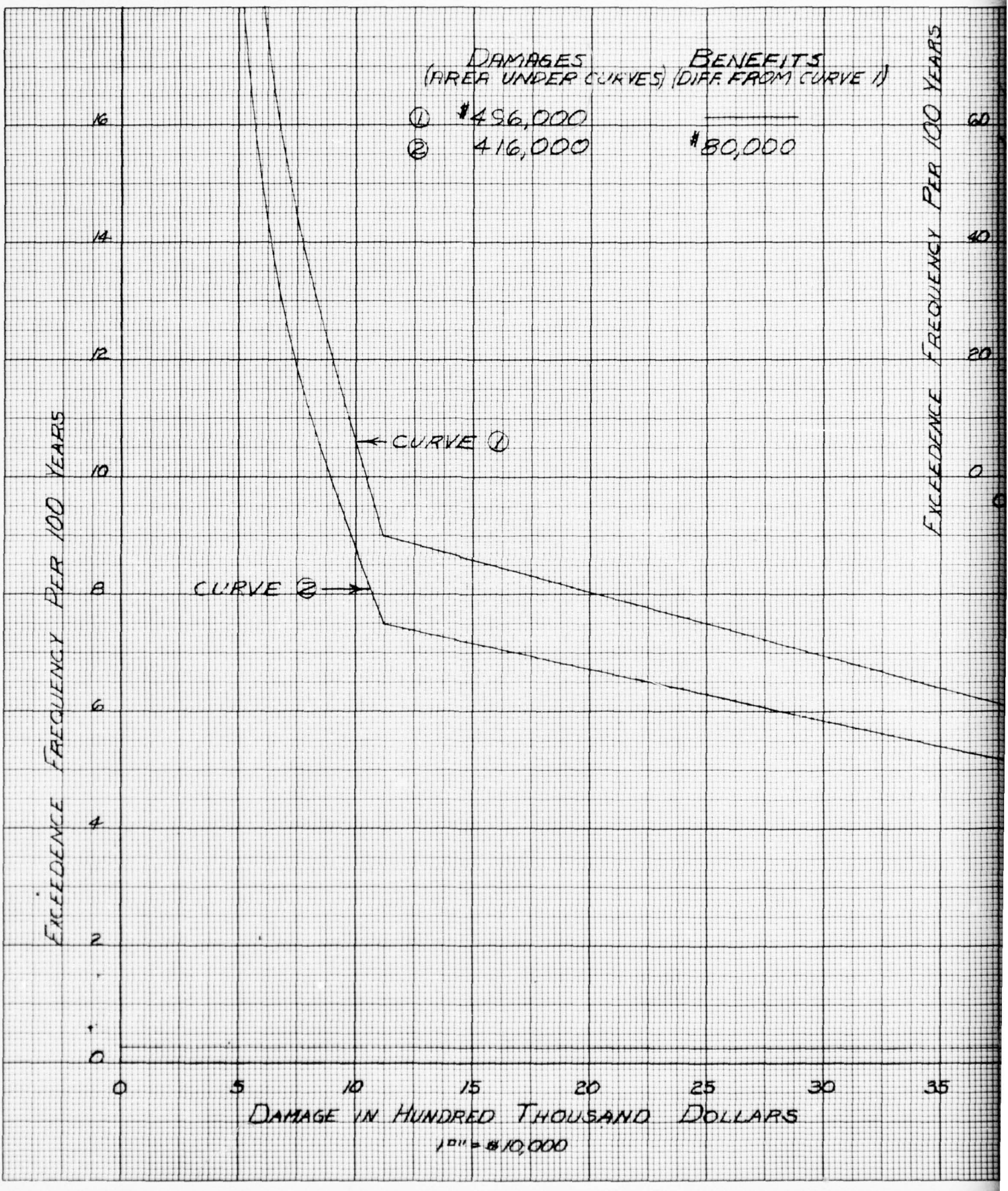
FREQUENCY DAMAGE CURVES WABASH RIVER

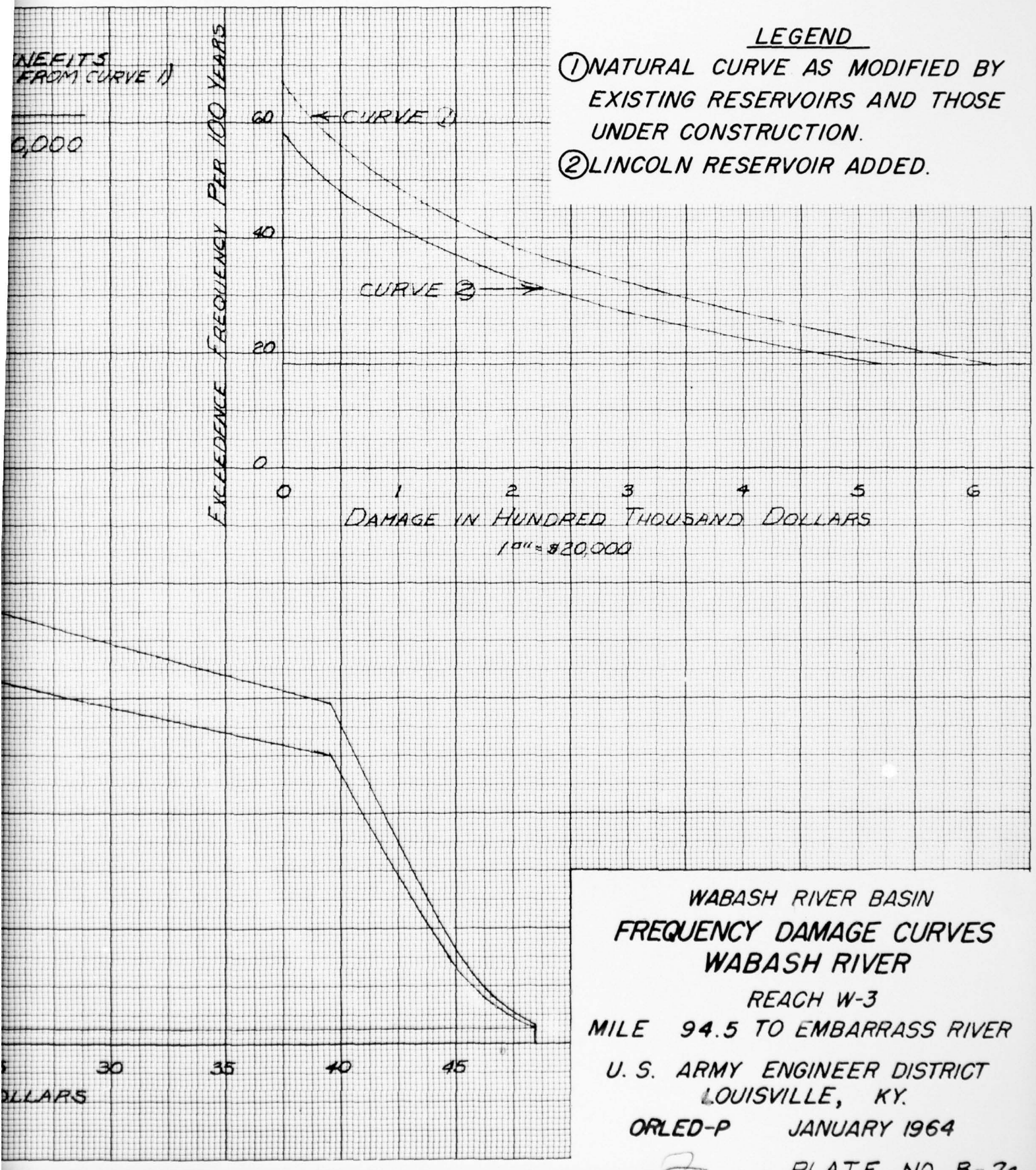
REACH W-2

MILE 40.0 TO MILE 94.5

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

2 PLATE NO. B-76


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $496,000
② 416,000
$80,000
CURVE ①
CURVE ②
EXCEEDENCE FREQUENCY PER 100 YEARS
EXCEEDENCE FREQUENCY PER 100 YEARS
0
2
4
6
8
10
12
14
16
0
20
40
60
0
5
10
15
20
25
30
35
DAMAGE IN HUNDRED THOUSAND DOLLARS
1" = $10,000



LEGEND

(1) NATURAL CURVE AS MODIFIED BY EXISTING RESERVOIRS AND THOSE UNDER CONSTRUCTION.

(2) LINCOLN RESERVOIR ADDED.

WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES WABASH RIVER

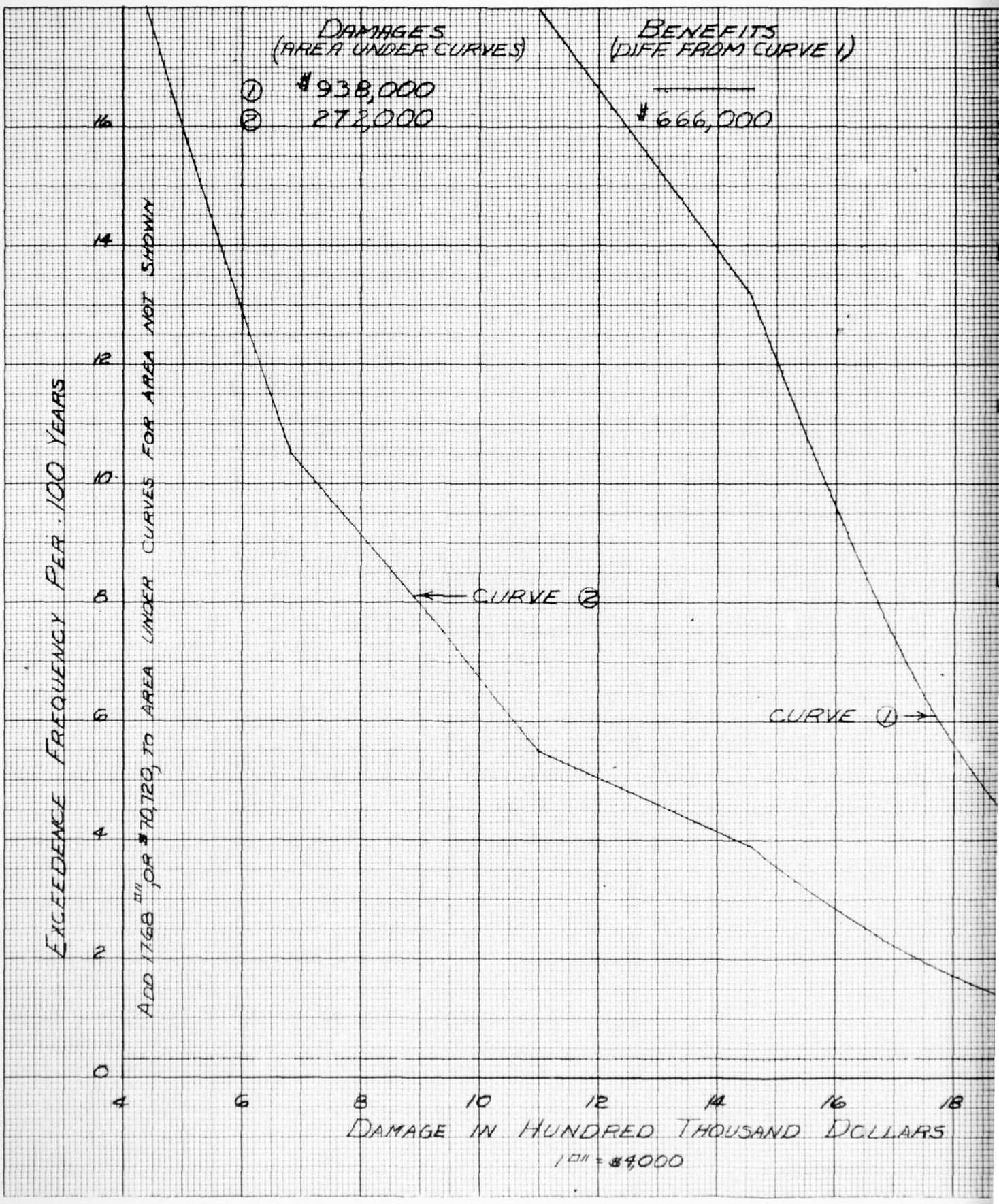
REACH W-3

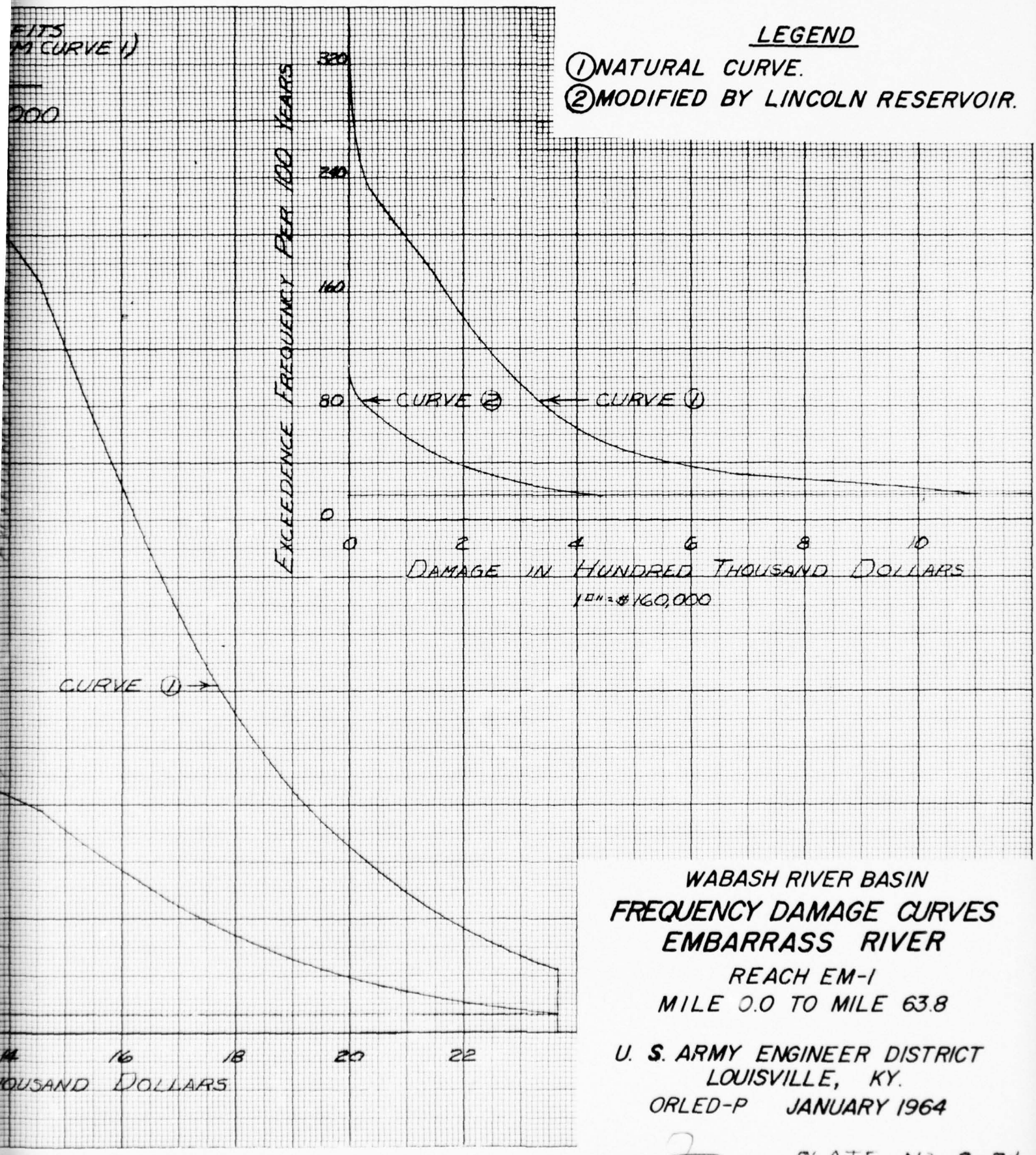
MILE 94.5 TO EMBARRASS RIVER

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7c


DAMAGES
(AREA UNDER CURVES)
① $938,000
② 272,000
BENEFITS
(DIFF FROM CURVE 1)
$666,000
CURVE ②
CURVE ①
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 17.68 IN. OR $70,720 TO AREA UNDER CURVES FOR AREA NOT SHOWN
0
2
4
6
8
10
12
14
16
4
6
8
10
12
14
16
18
DAMAGE IN HUNDRED THOUSAND DOLLARS
1 IN = $4000



WABASH RIVER BASIN

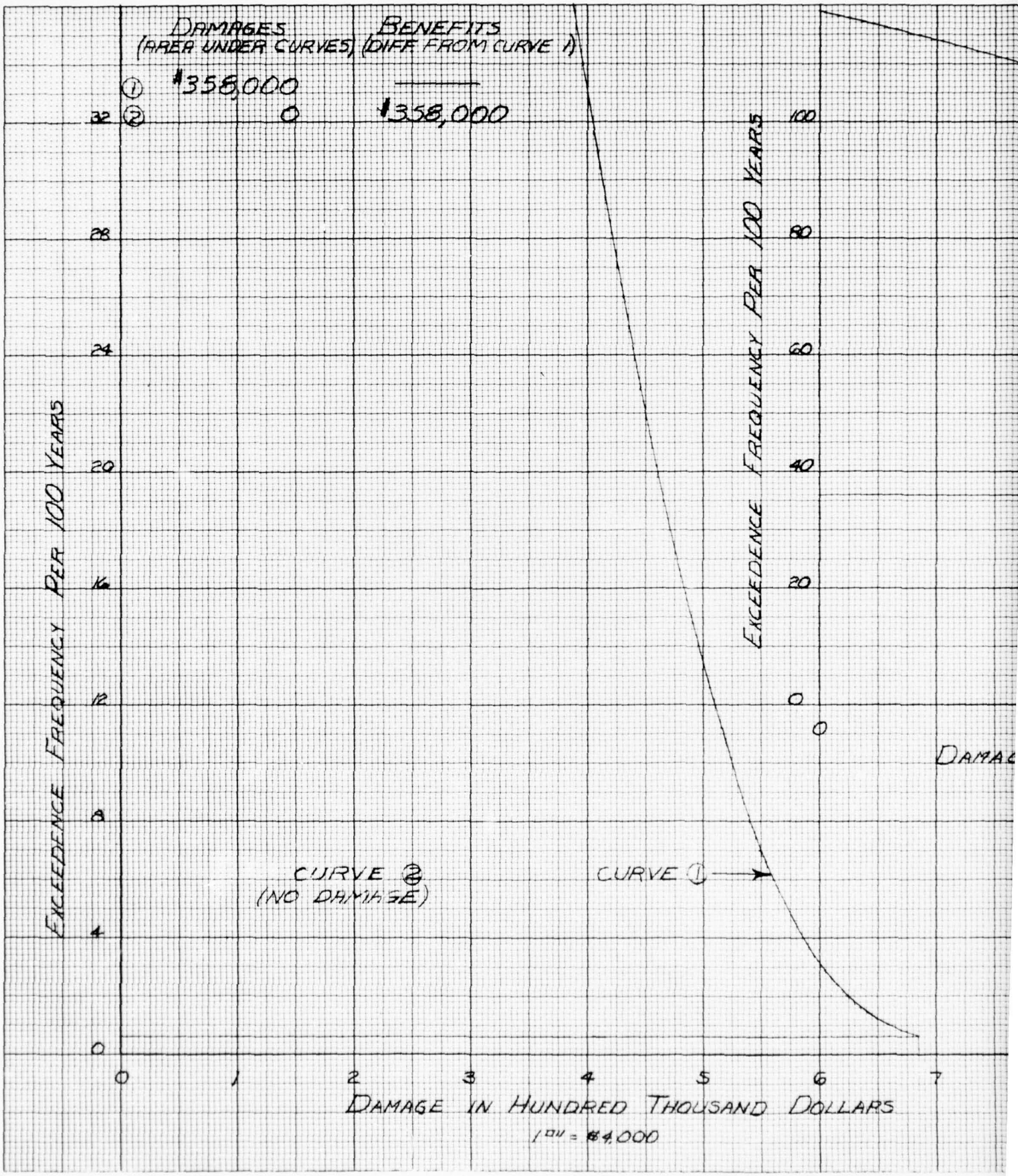
FREQUENCY DAMAGE CURVES EMBARRASS RIVER

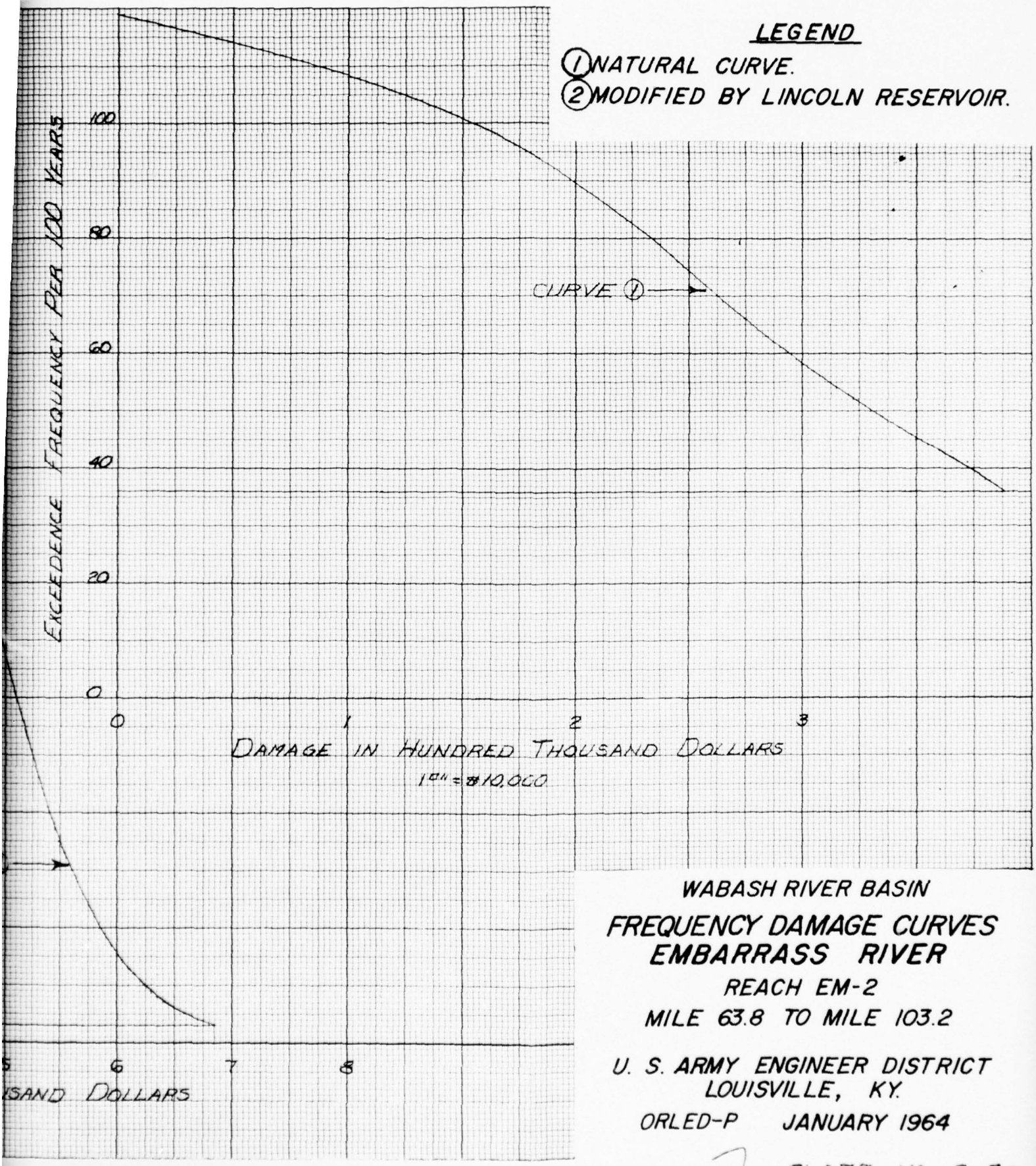
REACH EM-1

MILE 0.0 TO MILE 63.8

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-7d


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF FROM CURVE 1)
① $358,000
② 0
$358,000
EXCEEDENCE FREQUENCY PER 100 YEARS
32
28
24
20
16
12
8
4
0
100
80
60
40
20
0
0
CURVE ② (NO DAMAGE)
CURVE ①
0
1
2
3
4
5
6
7
DAMAGE IN HUNDRED THOUSAND DOLLARS
1" = $4,000



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES
EMBARRASS RIVER

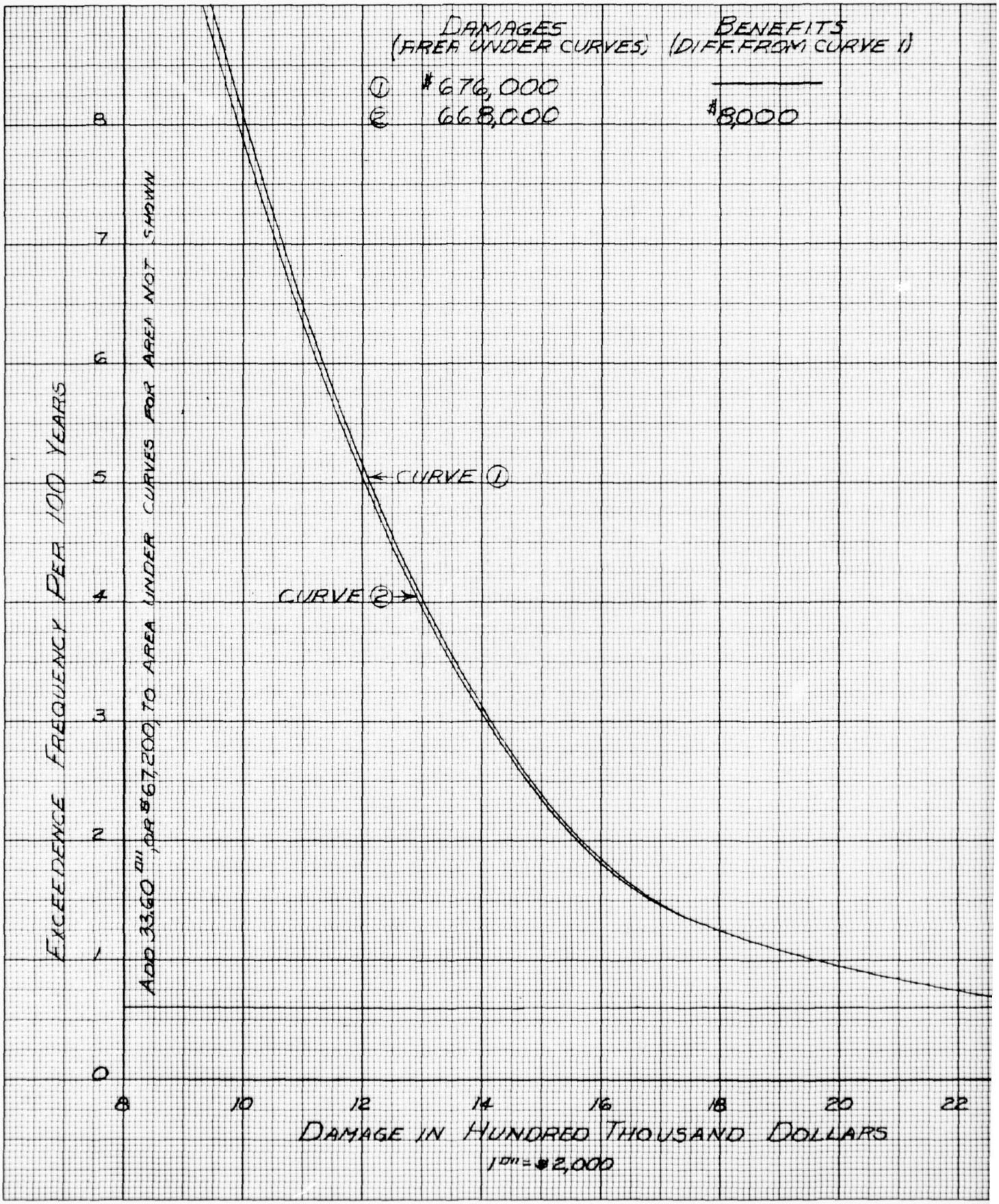
REACH EM-2

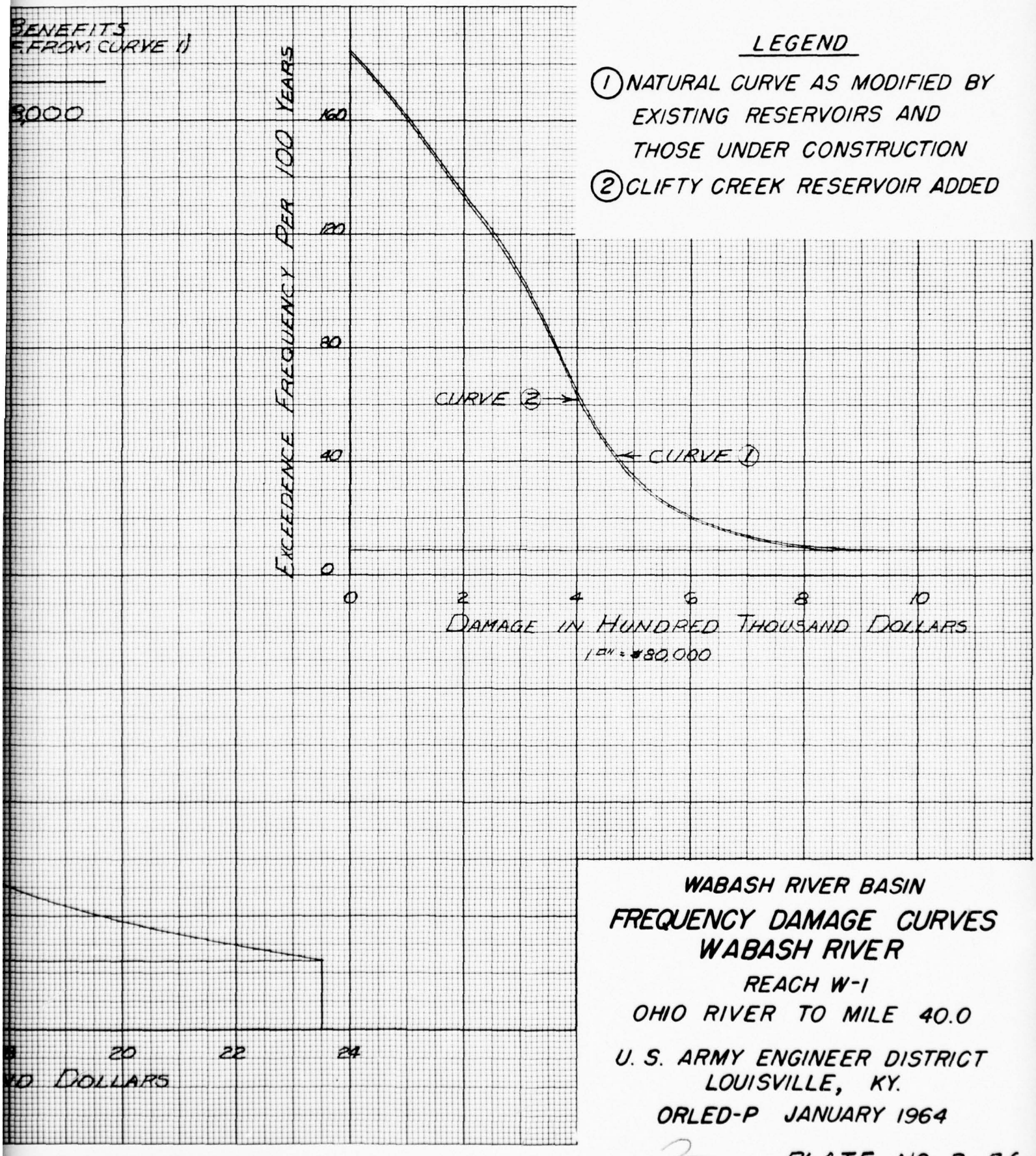
MILE 63.8 TO MILE 103.2

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7e


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $676,000
② 668,000
$8,000
CURVE ①
CURVE ②
ADD 33.60 SQ. IN. OR $67,200 TO AREA UNDER CURVES FOR AREA NOT SHOWN
EXCEEDENCE FREQUENCY PER 100 YEARS
8
7
6
5
4
3
2
1
0
8
10
12
14
16
18
20
22
DAMAGE IN HUNDRED THOUSAND DOLLARS
1 IN = $2,000



LEGEND

(1) NATURAL CURVE AS MODIFIED BY EXISTING RESERVOIRS AND THOSE UNDER CONSTRUCTION

(2) CLIFTY CREEK RESERVOIR ADDED

WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES WABASH RIVER

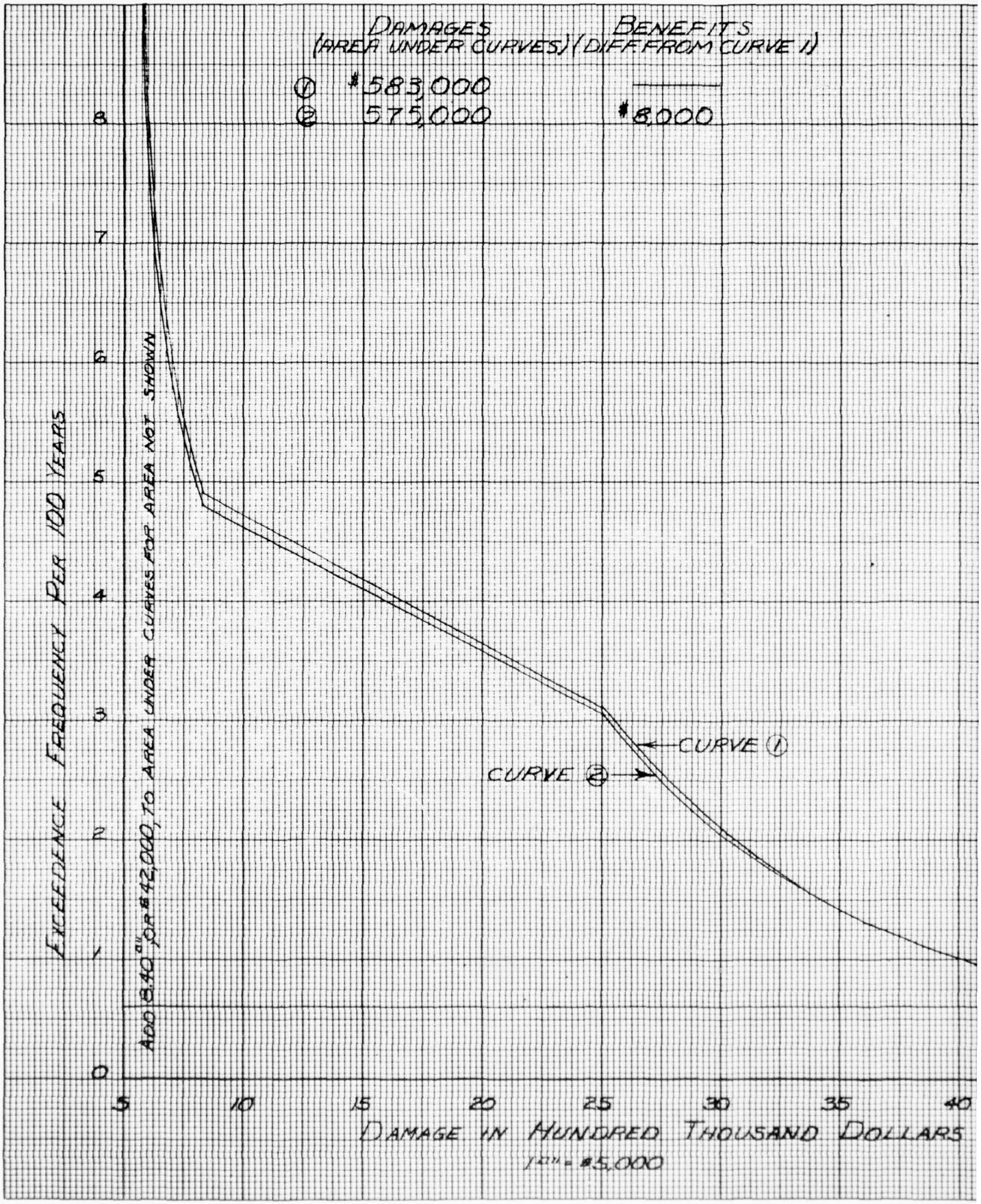
REACH W-1

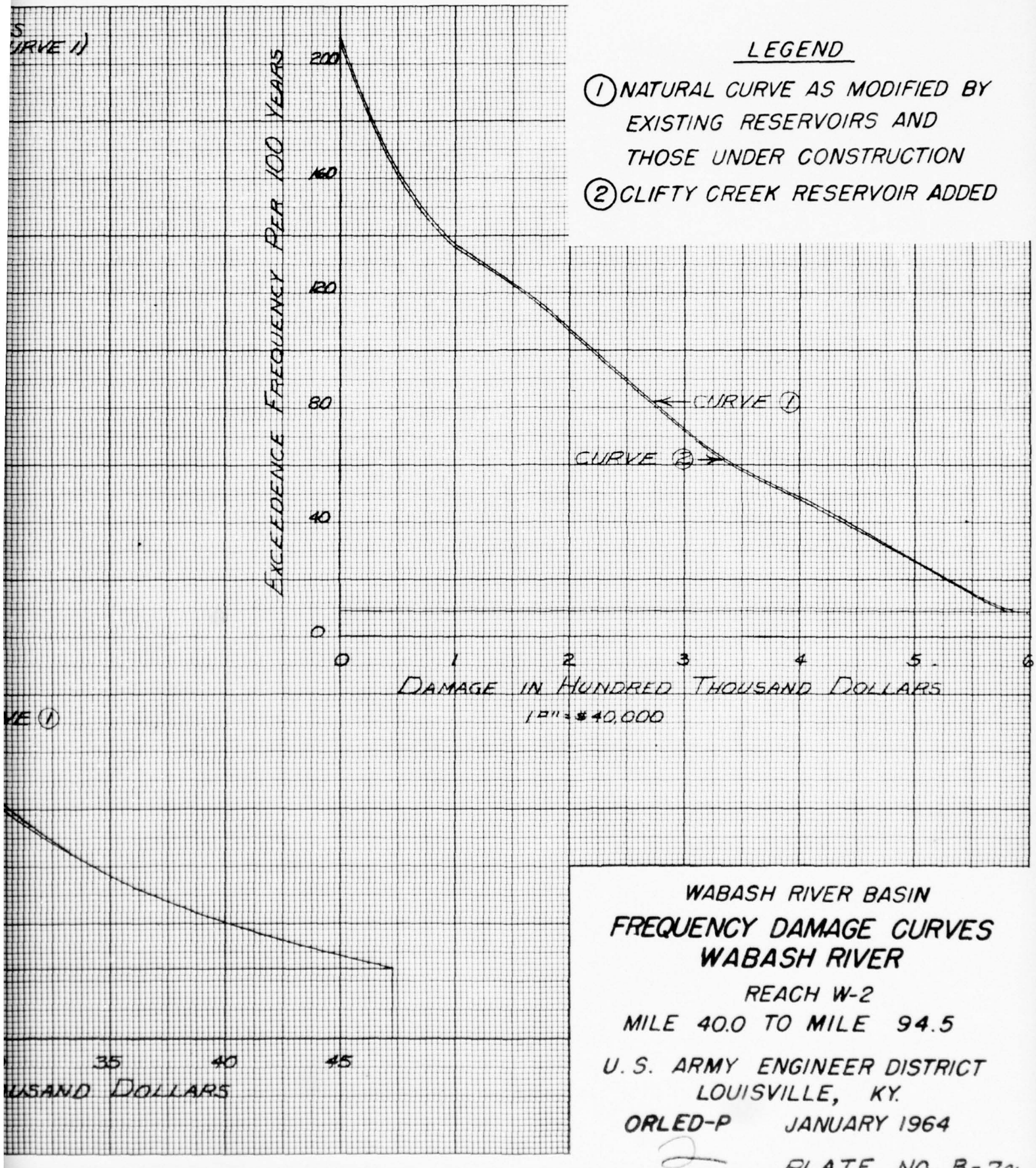
OHIO RIVER TO MILE 40.0

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

2 PLATE NO. B-7f


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF FROM CURVE 1)
① $583,000
② 575,000
$8,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 8.40 SQ IN FOR $42,000 TO AREA UNDER CURVES FOR AREA NOT SHOWN
CURVE ①
CURVE ②
0
1
2
3
4
5
6
7
8
5
10
15
20
25
30
35
40
DAMAGE IN HUNDRED THOUSAND DOLLARS
1" = $5,000



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES WABASH RIVER

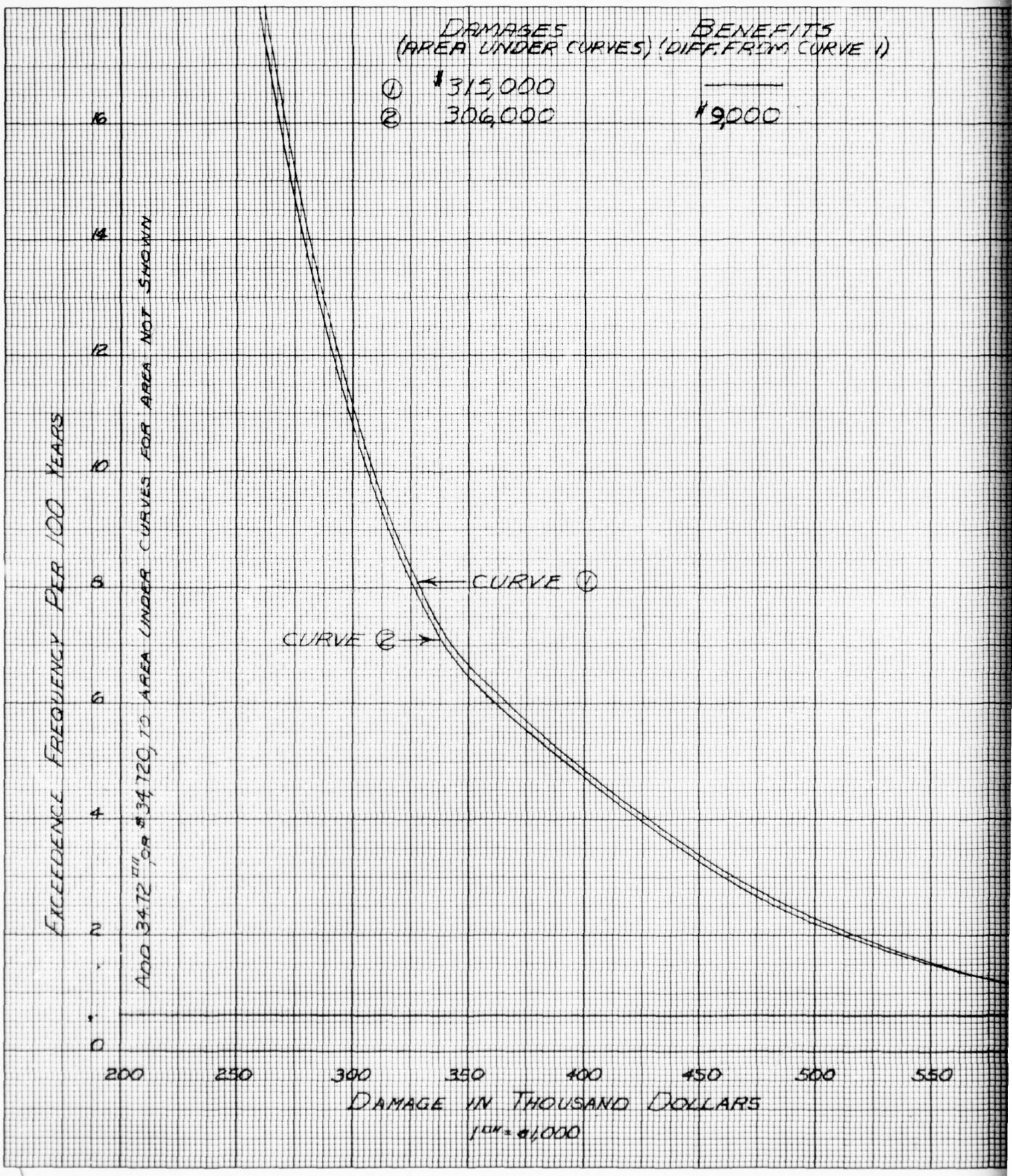
REACH W-2

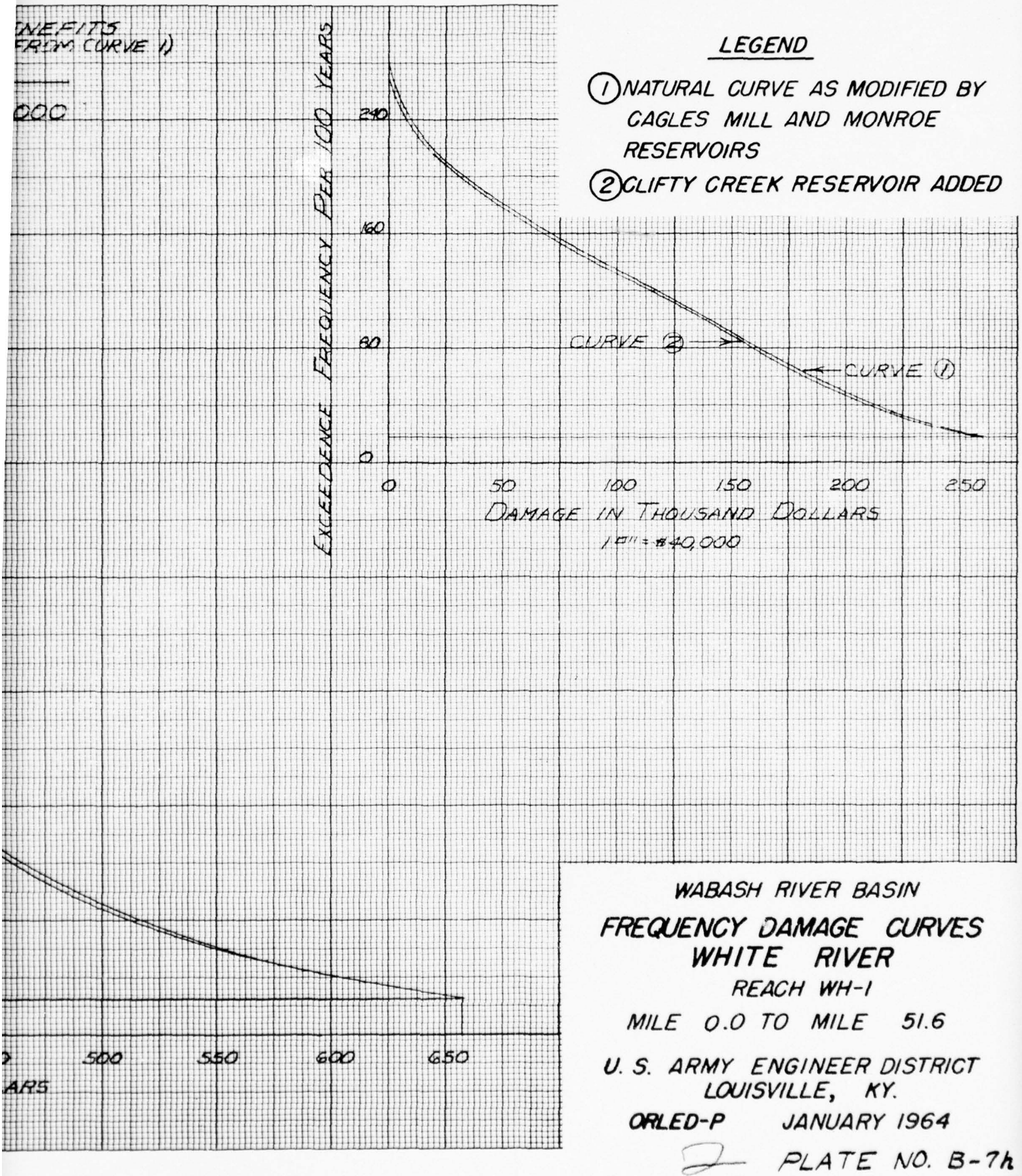
MILE 40.0 TO MILE 94.5

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $315,000
② 306,000
$9,000
CURVE ①
CURVE ②
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 34.72 TH FOR $34,720 TO AREA UNDER CURVES FOR AREA NOT SHOWN
16
14
12
10
8
6
4
2
0
200
250
300
350
400
450
500
550
DAMAGE IN THOUSAND DOLLARS
1 CM = $1,000



LEGEND

(1) NATURAL CURVE AS MODIFIED BY CAGLES MILL AND MONROE RESERVOIRS

(2) CLIFTY CREEK RESERVOIR ADDED

WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES
WHITE RIVER

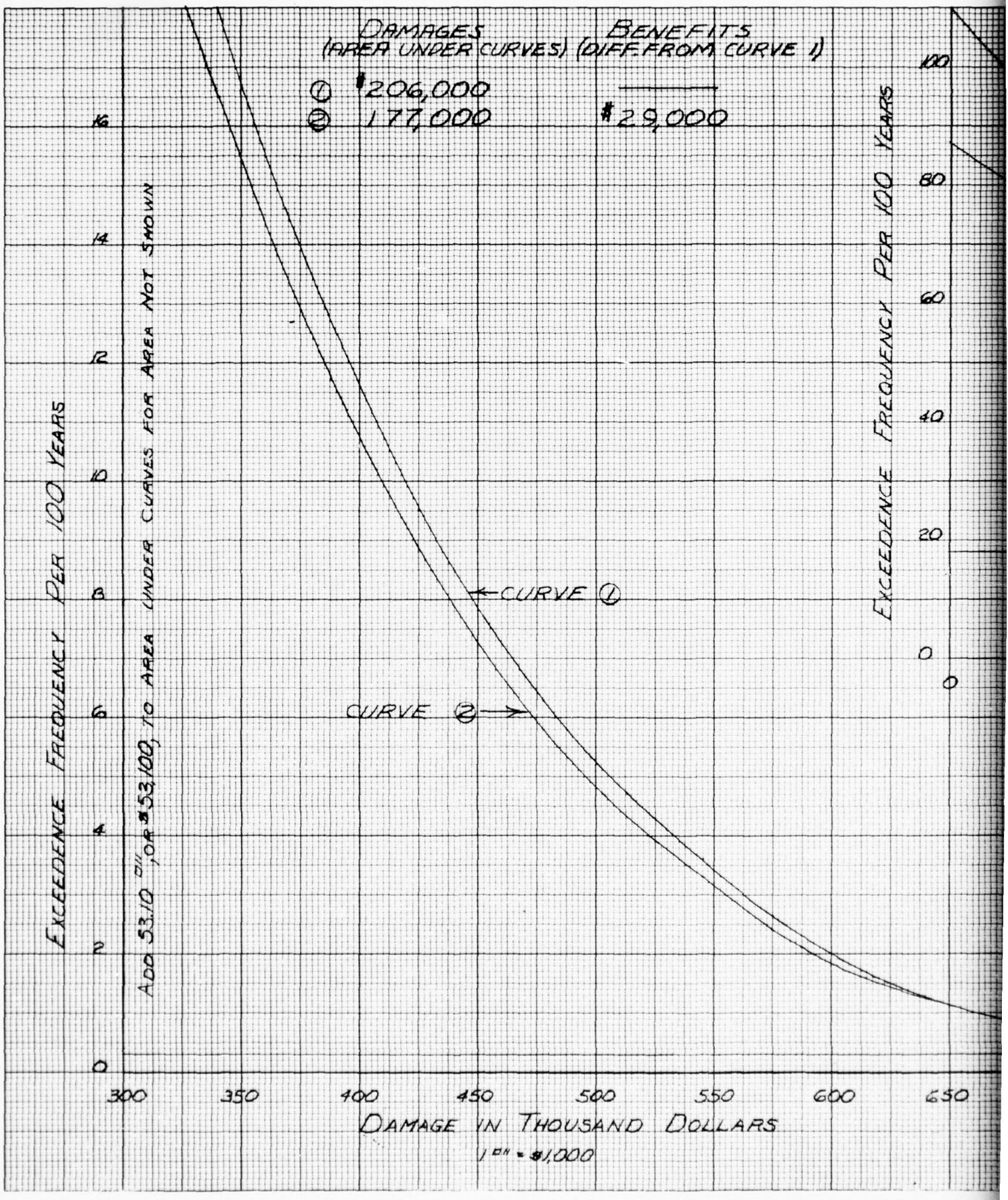
REACH WH-1

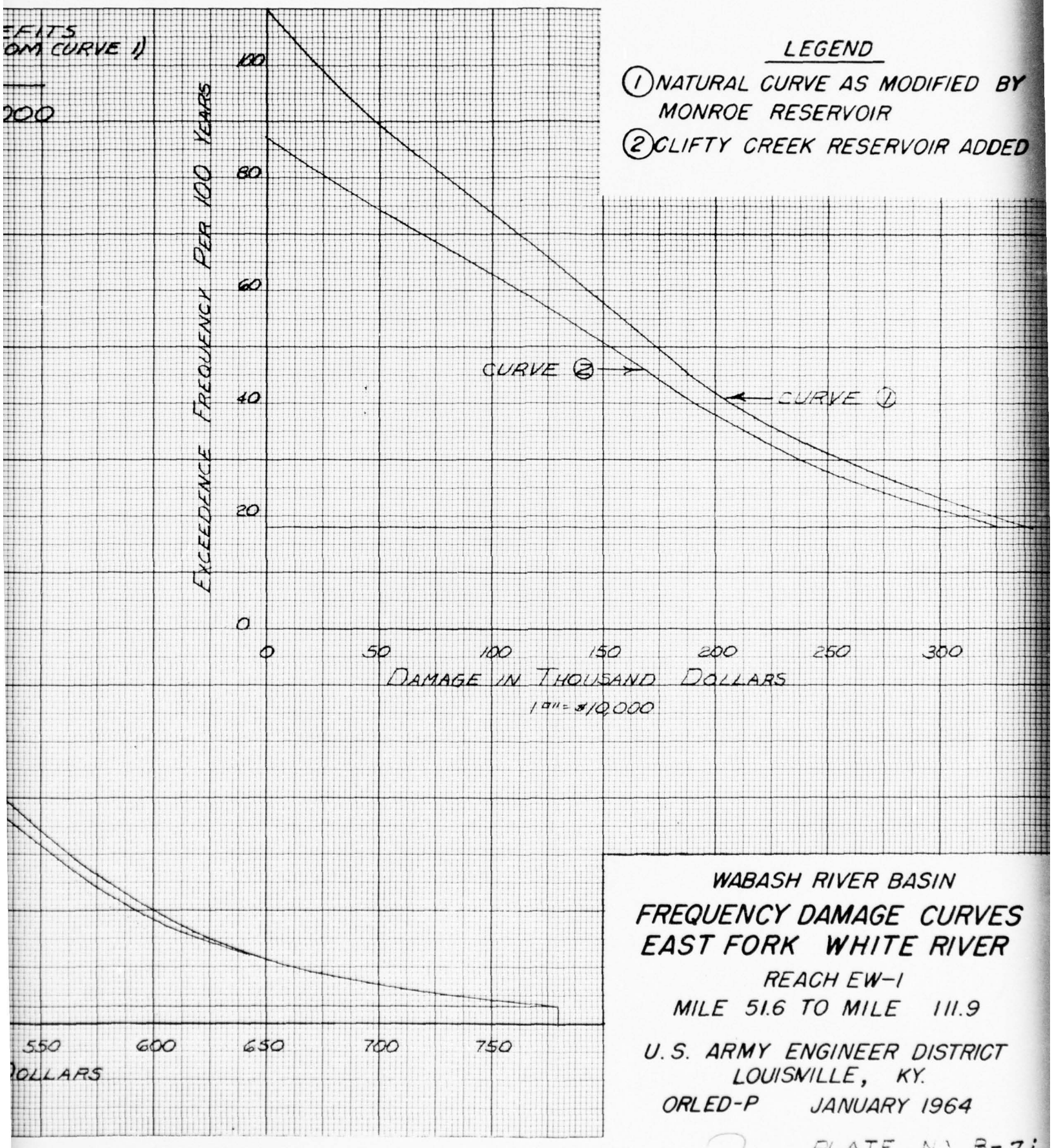
MILE 0.0 TO MILE 51.6

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7h


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $206,000
② 177,000
$29,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 53.10 % OR $53,100 TO AREA UNDER CURVES FOR AREA NOT SHOWN
CURVE ①
CURVE ②
0
4
8
10
12
14
16
20
40
60
80
100
300
350
400
450
500
550
600
650
DAMAGE IN THOUSAND DOLLARS
1 IN = $1,000



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES EAST FORK WHITE RIVER

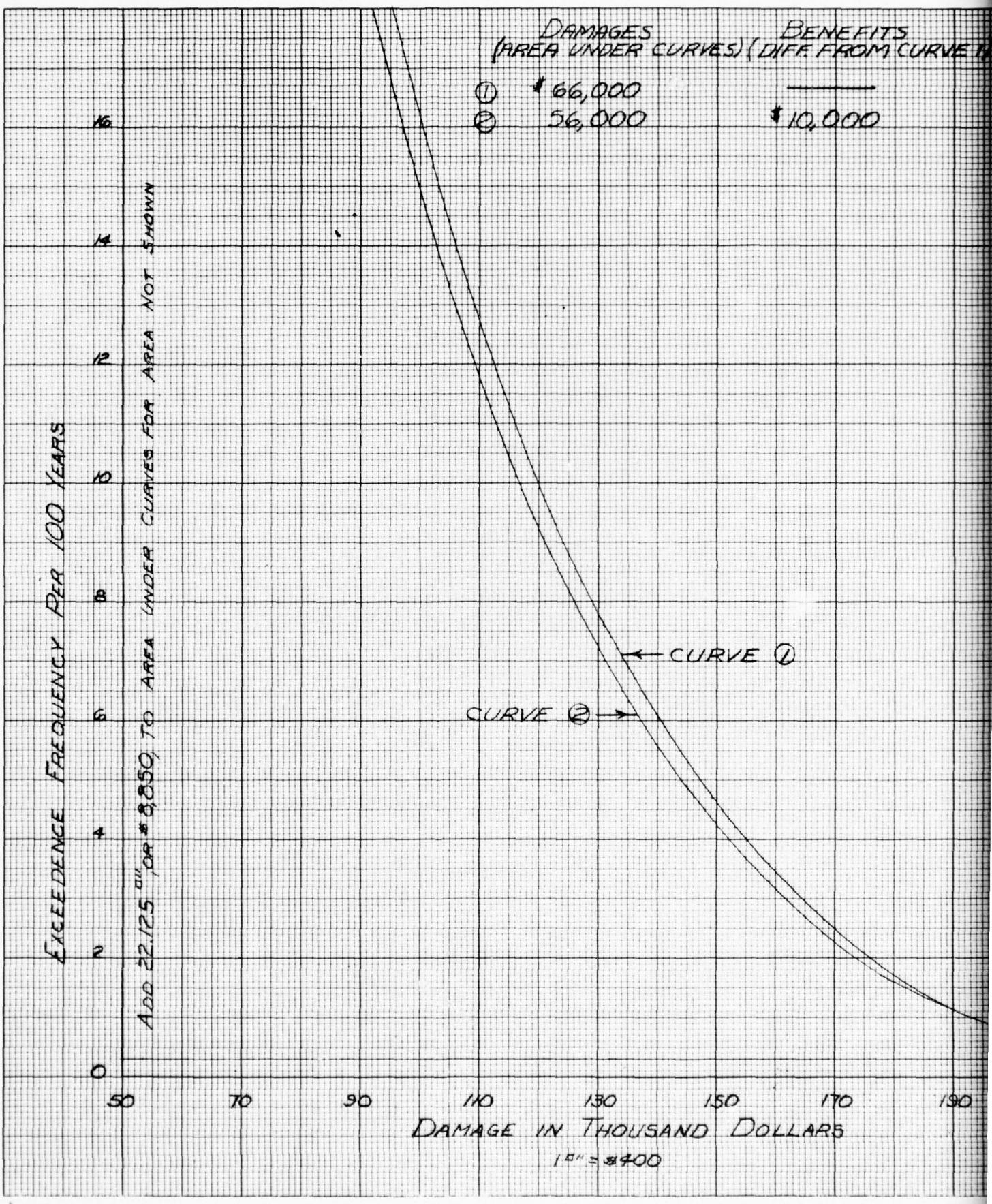
REACH EW-1

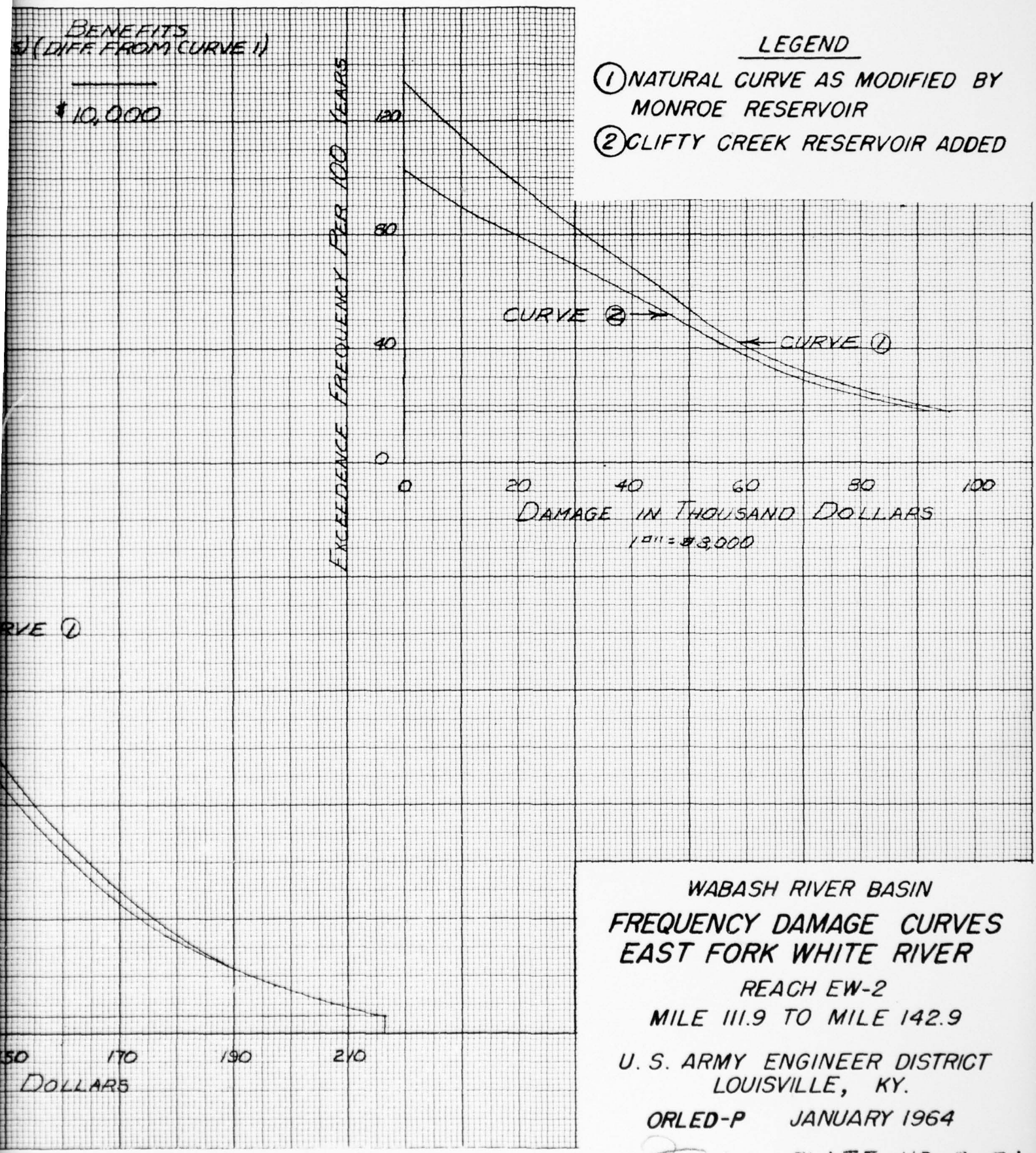
MILE 51.6 TO MILE 111.9

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

2 PLATE NO. B-7L


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF FROM CURVE 1)
① $66,000
② 56,000
$10,000
CURVE ①
CURVE ②
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 22.125" FOR $2,850 TO AREA UNDER CURVES FOR AREA NOT SHOWN
0
2
4
6
8
10
12
14
16
50
70
90
110
130
150
170
190
DAMAGE IN THOUSAND DOLLARS
1" = $400



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES EAST FORK WHITE RIVER

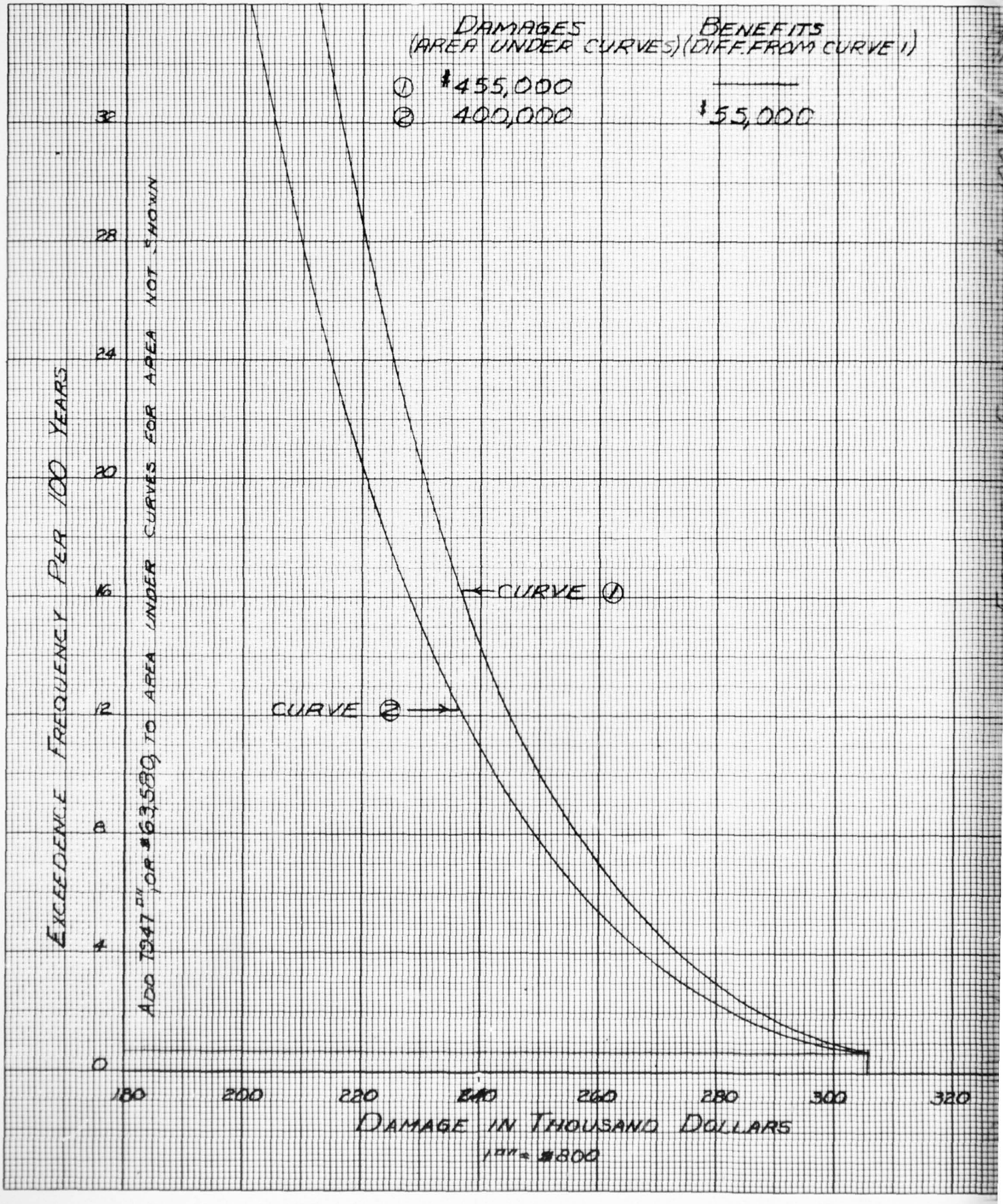
REACH EW-2

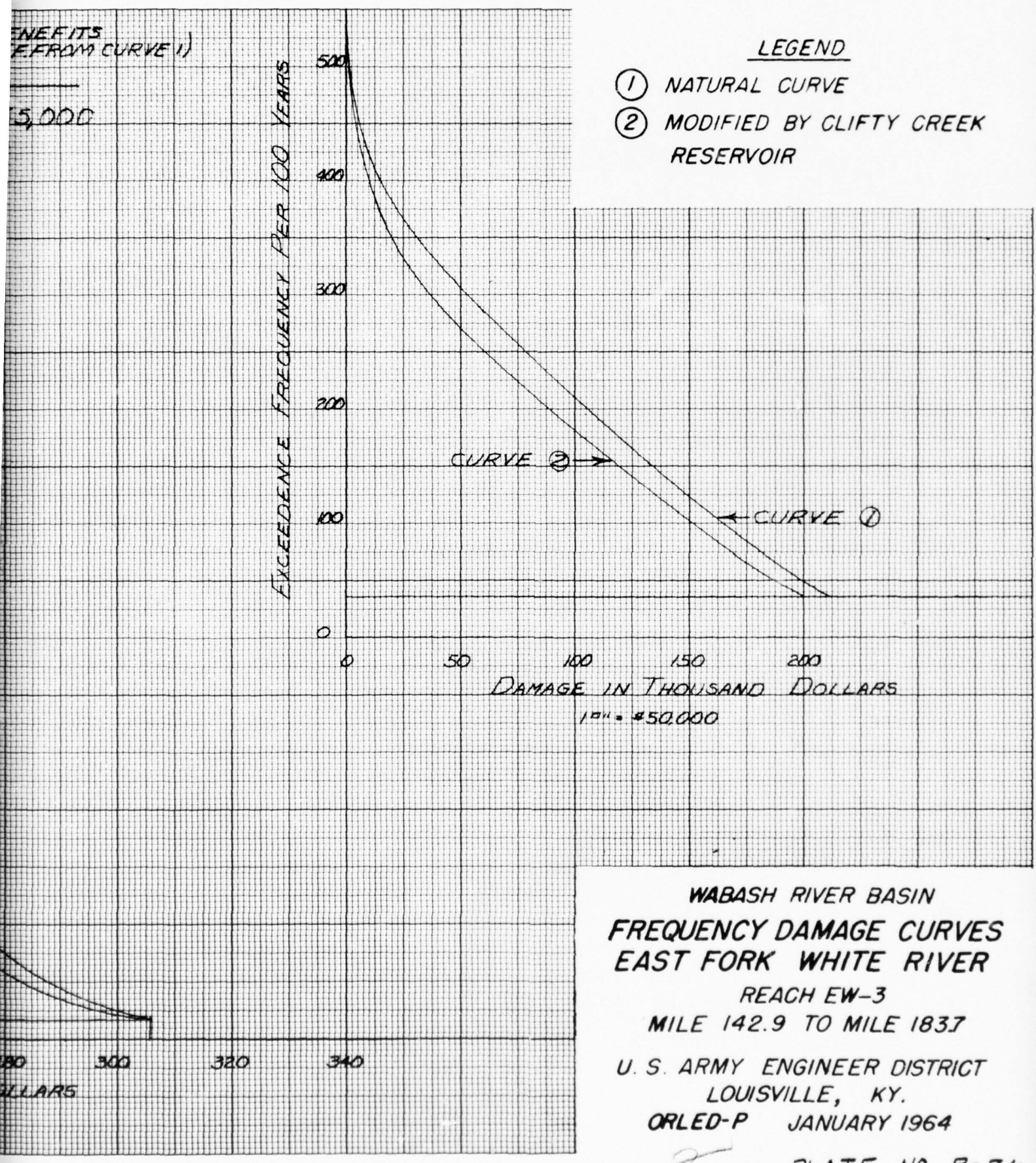
MILE 111.9 TO MILE 142.9

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7j


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $455,000
② 400,000
$55,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 1947 DV OF $63,580 TO AREA UNDER CURVES FOR AREA NOT SHOWN
CURVE ①
CURVE ②
0
4
8
12
16
20
24
28
32
180
200
220
240
260
280
300
320
DAMAGE IN THOUSAND DOLLARS
1" = $800



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES EAST FORK WHITE RIVER

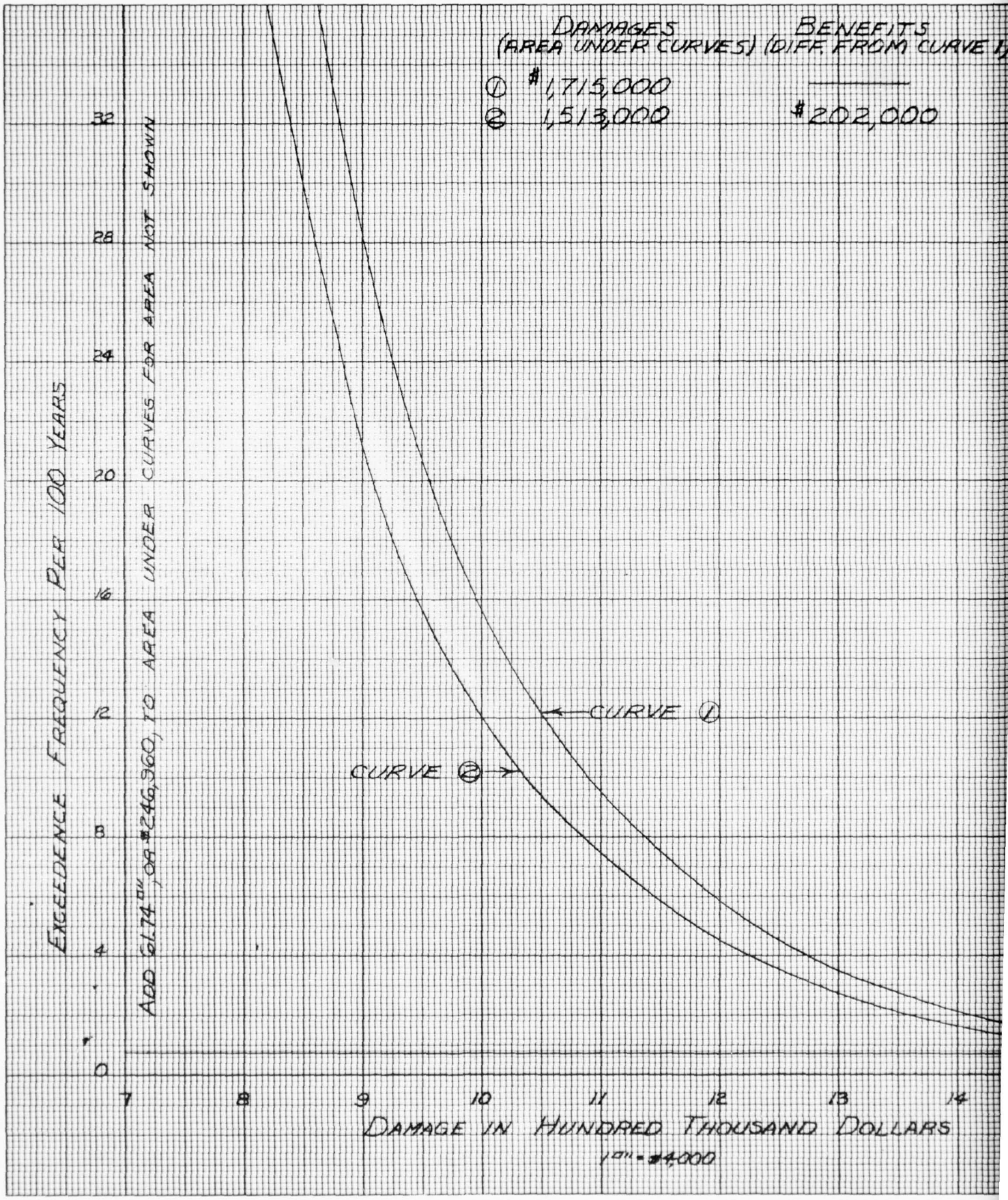
REACH EW-3

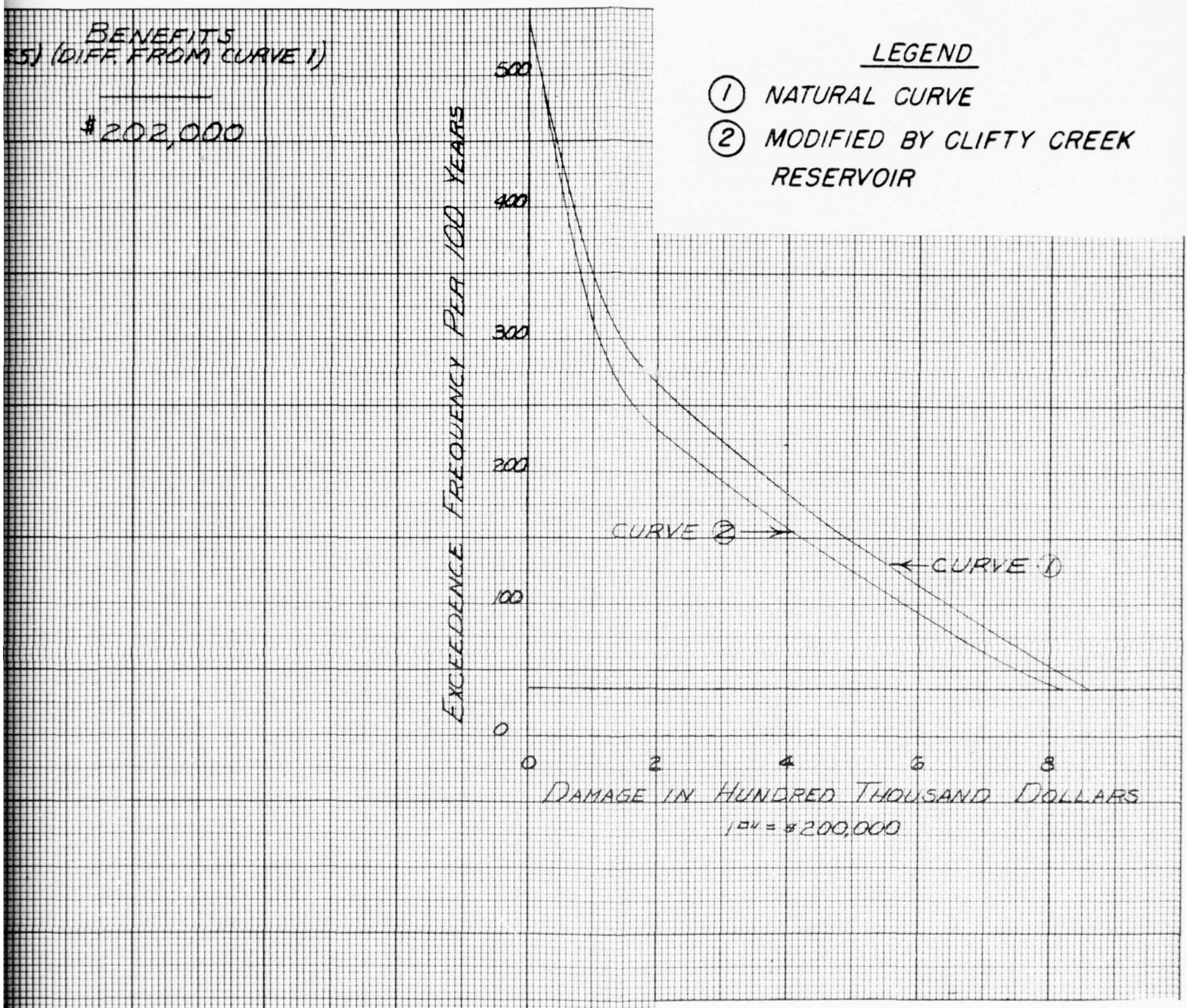
MILE 142.9 TO MILE 183.7

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7k


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $1,715,000
② 1,513,000
$202,000
EXCEEDENCE FREQUENCY PER 100 YEARS
32
28
24
20
16
12
8
4
0
ADD 1.74^{ON} ON $246,960, TO AREA UNDER CURVES FOR AREA NOT SHOWN
CURVE ①
CURVE ②
7
8
9
10
11
12
13
14
DAMAGE IN HUNDRED THOUSAND DOLLARS
1 cm = $4,000



LEGEND

(1) NATURAL CURVE

(2) MODIFIED BY CLIFTY CREEK RESERVOIR

WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES EAST FORK WHITE RIVER

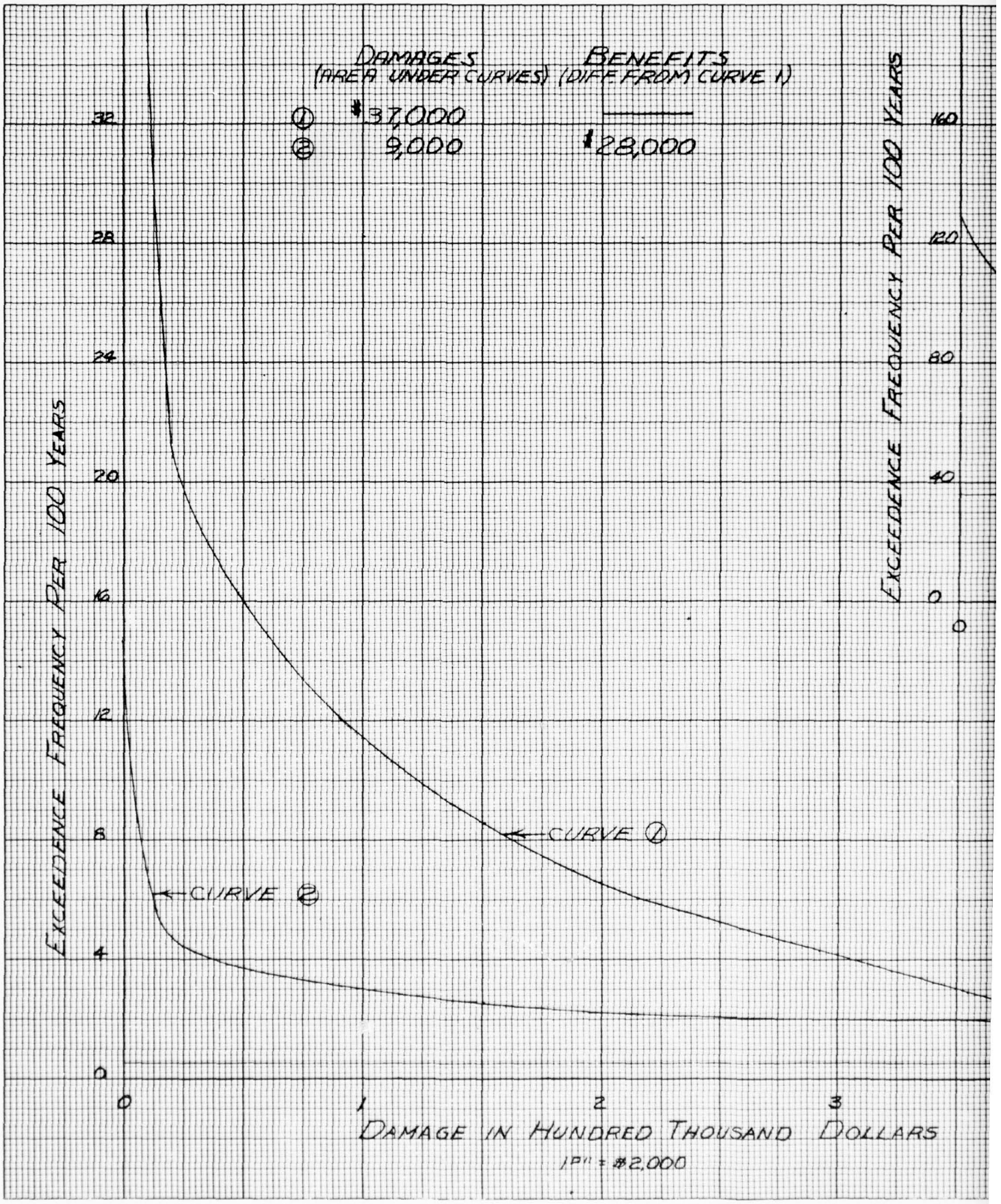
REACH EW-4

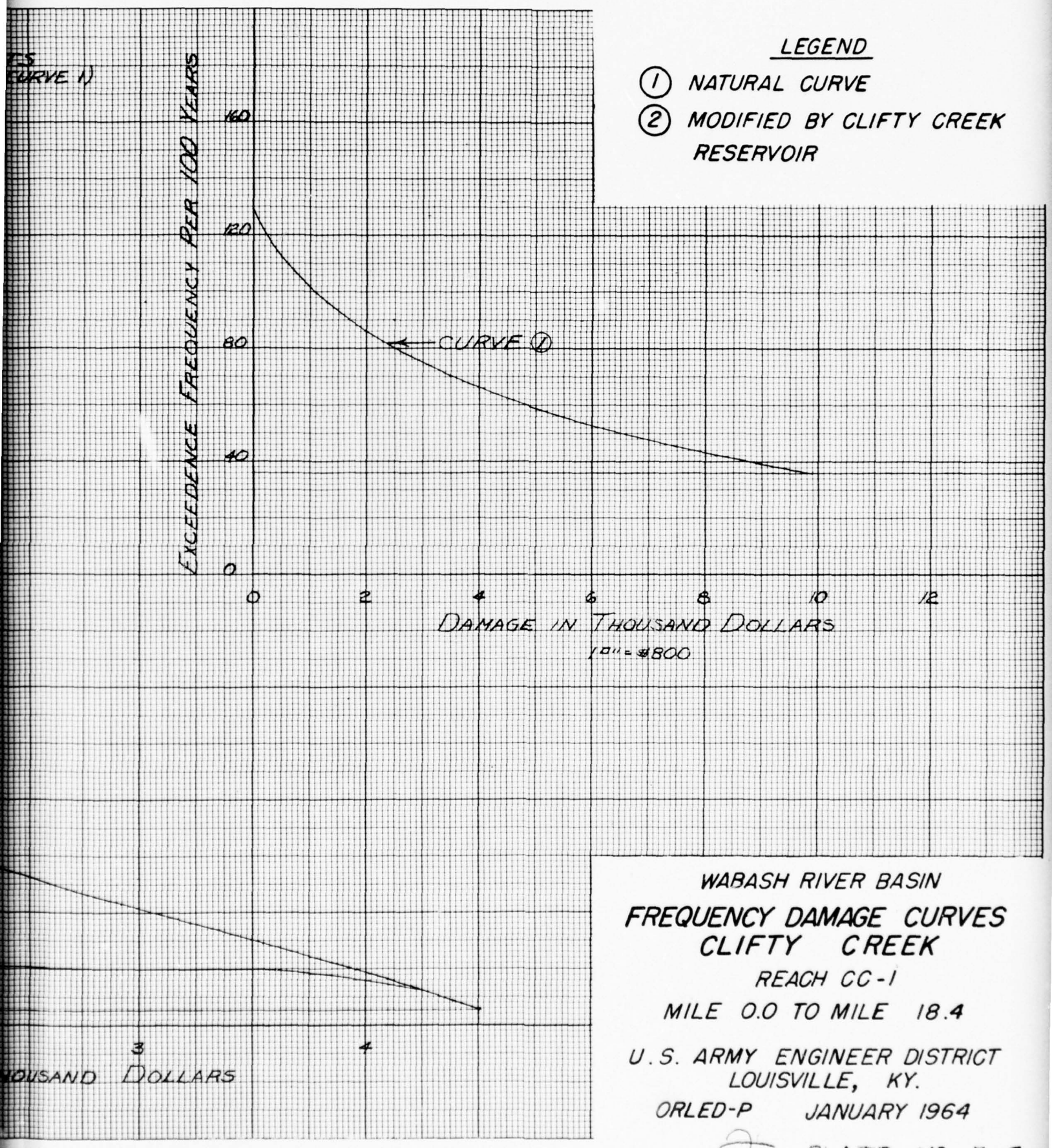
MILE 183.7 TO MILE 238.3

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-74


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF FROM CURVE 1)
① $37,000
② 9,000
$28,000
EXCEEDENCE FREQUENCY PER 100 YEARS
32
28
24
20
16
12
8
4
0
160
120
80
40
0
0
1
2
3
CURVE ①
CURVE ②
DAMAGE IN HUNDRED THOUSAND DOLLARS
1" = $2,000



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES CLIFTY CREEK

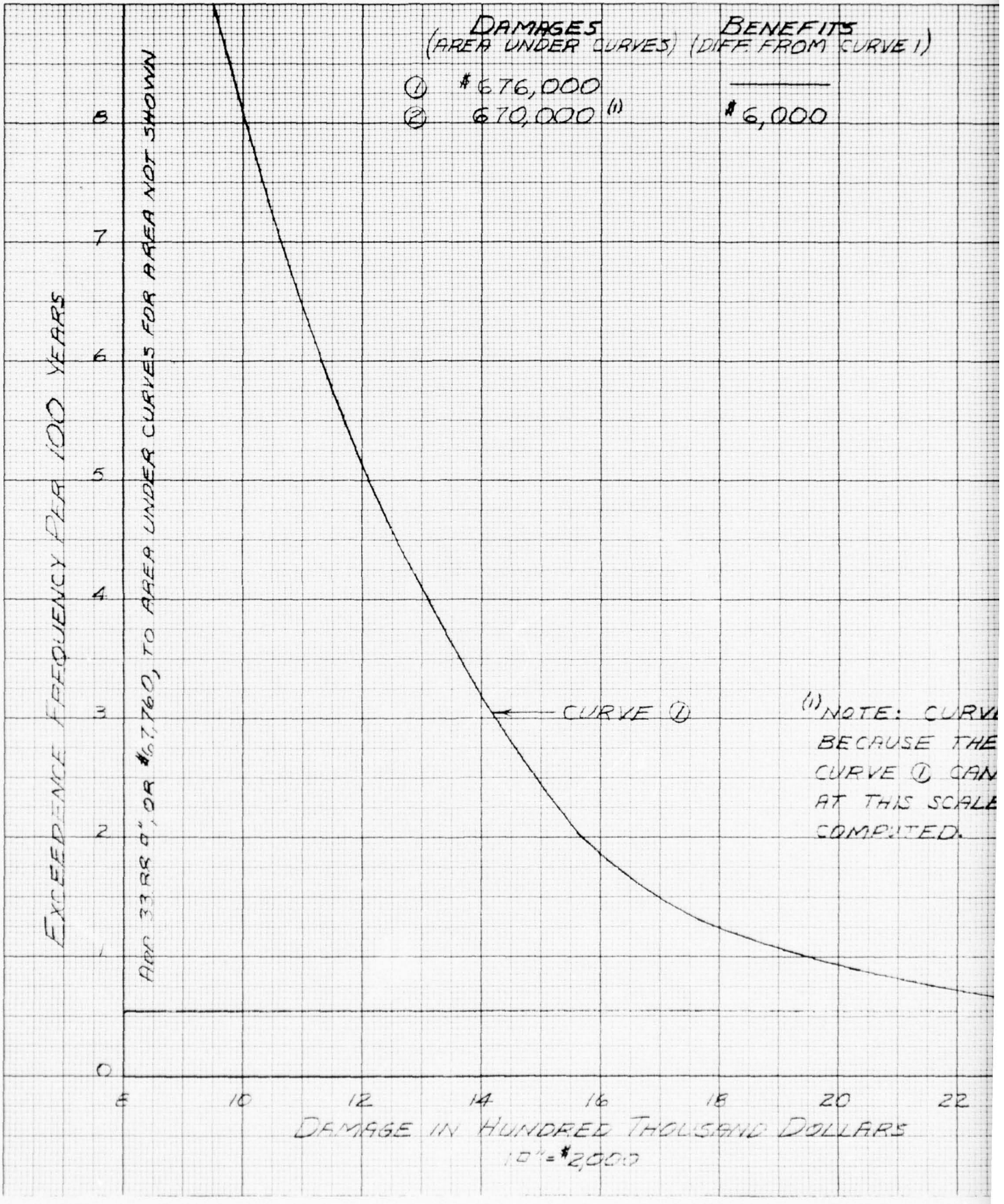
REACH CC-1

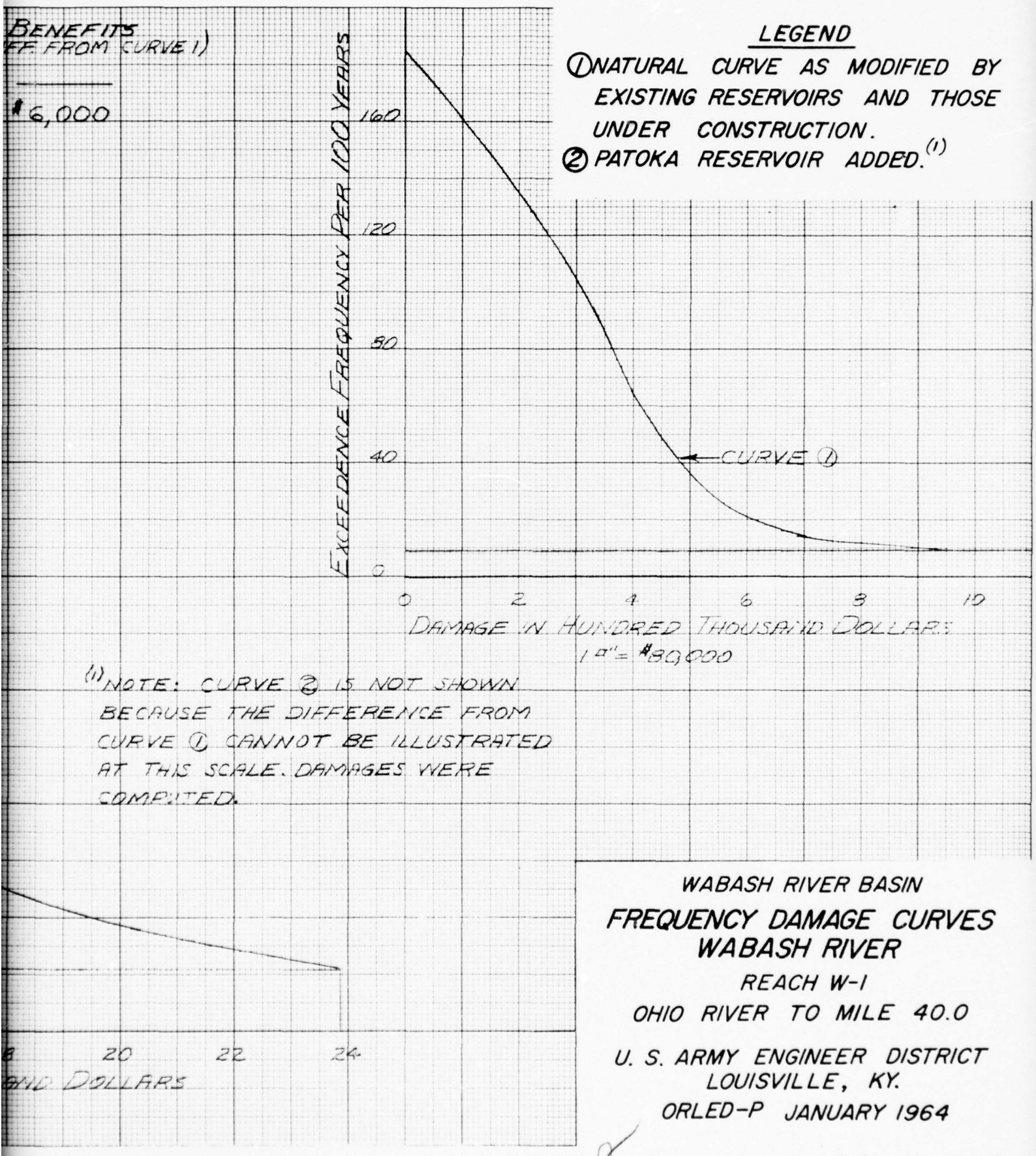
MILE 0.0 TO MILE 18.4

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7m


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF FROM CURVE 1)
① $676,000
② $670,000 (1)
$6,000
EXCEEDENCE FREQUENCY PER 100 YEARS
AREA 33.88 0", OR $67,760, TO AREA UNDER CURVES FOR AREA NOT SHOWN
CURVE ①
(1) NOTE: CURVE
BECAUSE THE
CURVE ① CAN
AT THIS SCALE
COMPUTED.
0
1
2
3
4
5
6
7
8
8
10
12
14
16
18
20
22
DAMAGE IN HUNDRED THOUSAND DOLLARS
10" = $2,000



LEGEND

① NATURAL CURVE AS MODIFIED BY EXISTING RESERVOIRS AND THOSE UNDER CONSTRUCTION.

② PATOKA RESERVOIR ADDED.[1]

[1] NOTE: CURVE ② IS NOT SHOWN BECAUSE THE DIFFERENCE FROM CURVE ① CANNOT BE ILLUSTRATED AT THIS SCALE. DAMAGES WERE COMPUTED.

WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES WABASH RIVER

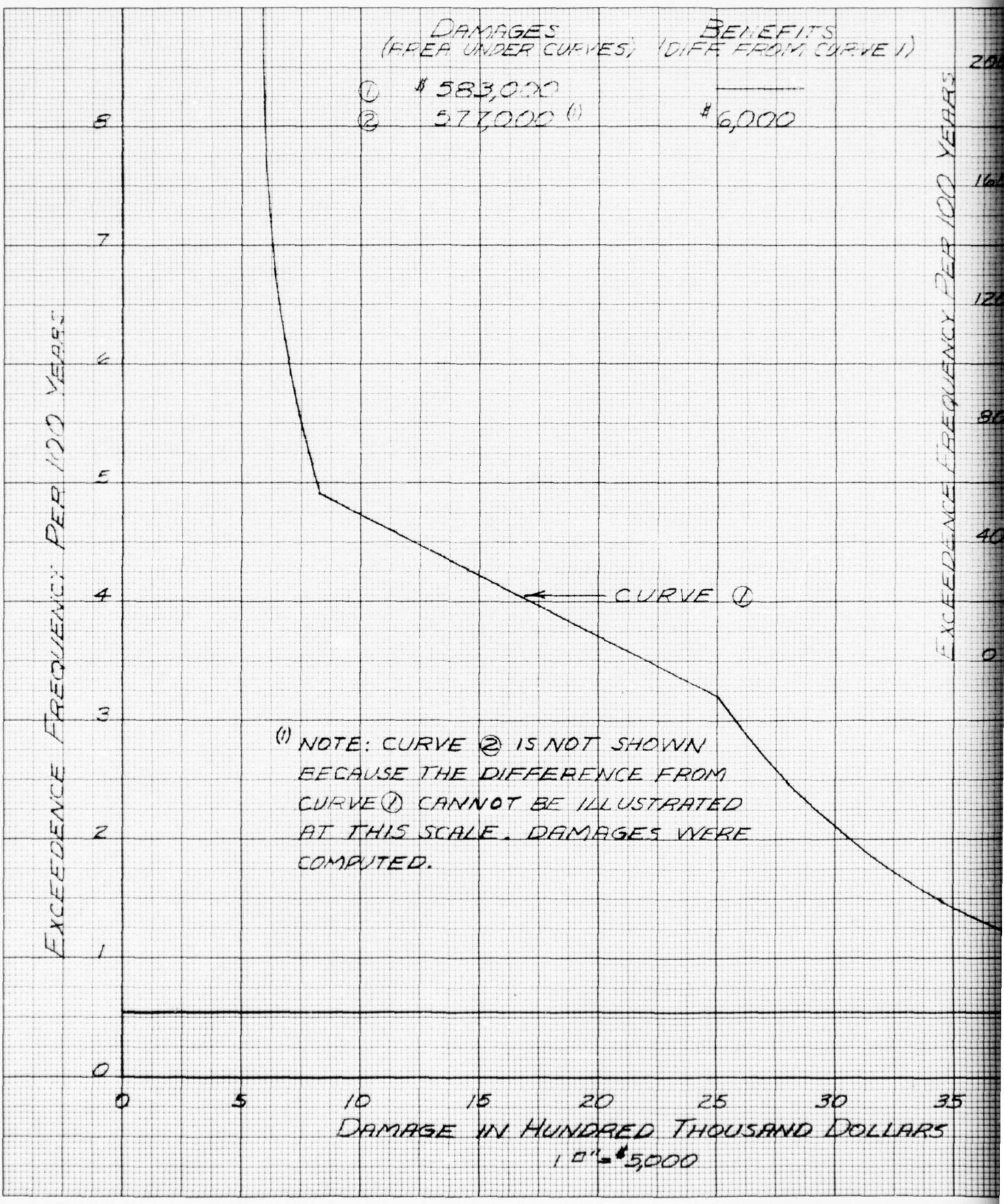
REACH W-1

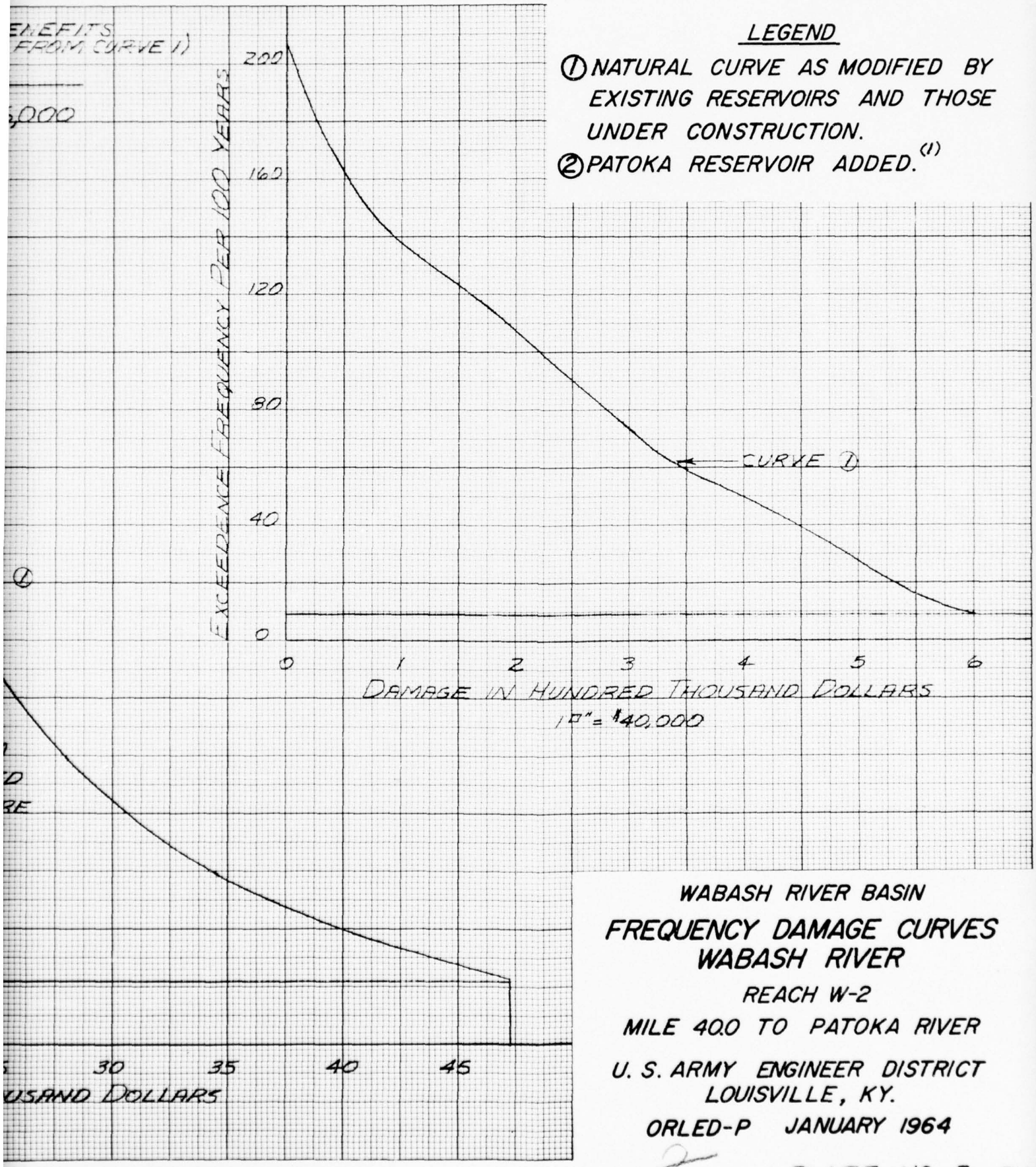
OHIO RIVER TO MILE 40.0

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7n


DAMAGES
(AREA UNDER CURVES)
BENEFITS
(DIFF. FROM CURVE 1)
① $583,000
② 577,000 (1)
$6,000
CURVE ①
(1) NOTE: CURVE ② IS NOT SHOWN BECAUSE THE DIFFERENCE FROM CURVE ① CANNOT BE ILLUSTRATED AT THIS SCALE. DAMAGES WERE COMPUTED.
EXCEEDENCE FREQUENCY PER 100 YEARS
EXCEEDENCE FREQUENCY PER 100 YEARS
0
1
2
3
4
5
6
7
0
5
10
15
20
25
30
35
DAMAGE IN HUNDRED THOUSAND DOLLARS
1 0" = $5,000



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES WABASH RIVER

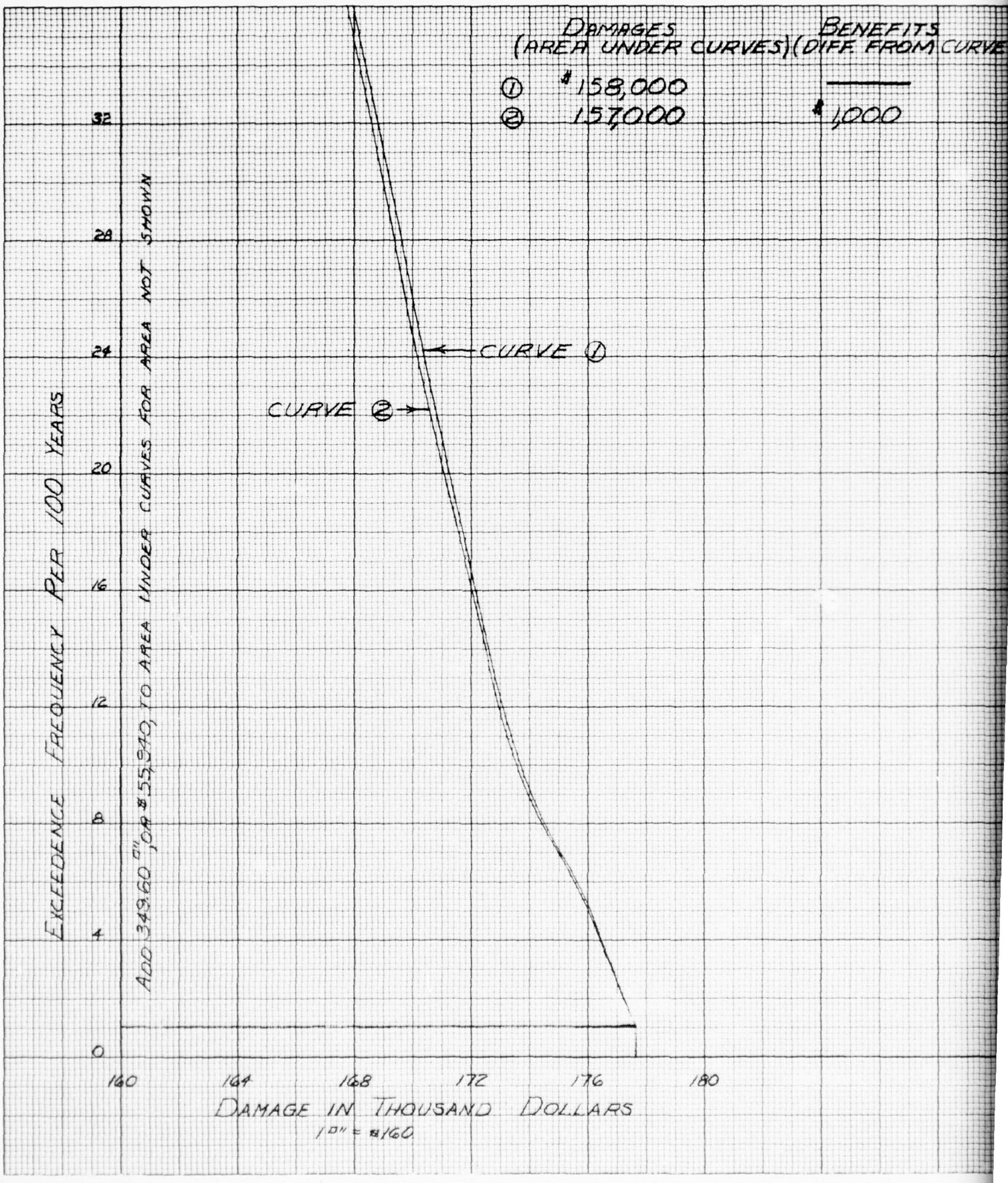
REACH W-2

MILE 40.0 TO PATOKA RIVER

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B- 7


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE
① $158,000
② 157,000
$1,000
CURVE ①
CURVE ②
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 349.60 "0" OR $55,940 TO AREA UNDER CURVES FOR AREA NOT SHOWN
32
28
24
20
16
12
8
4
0
160
164
168
172
176
180
DAMAGE IN THOUSAND DOLLARS
1" = $160

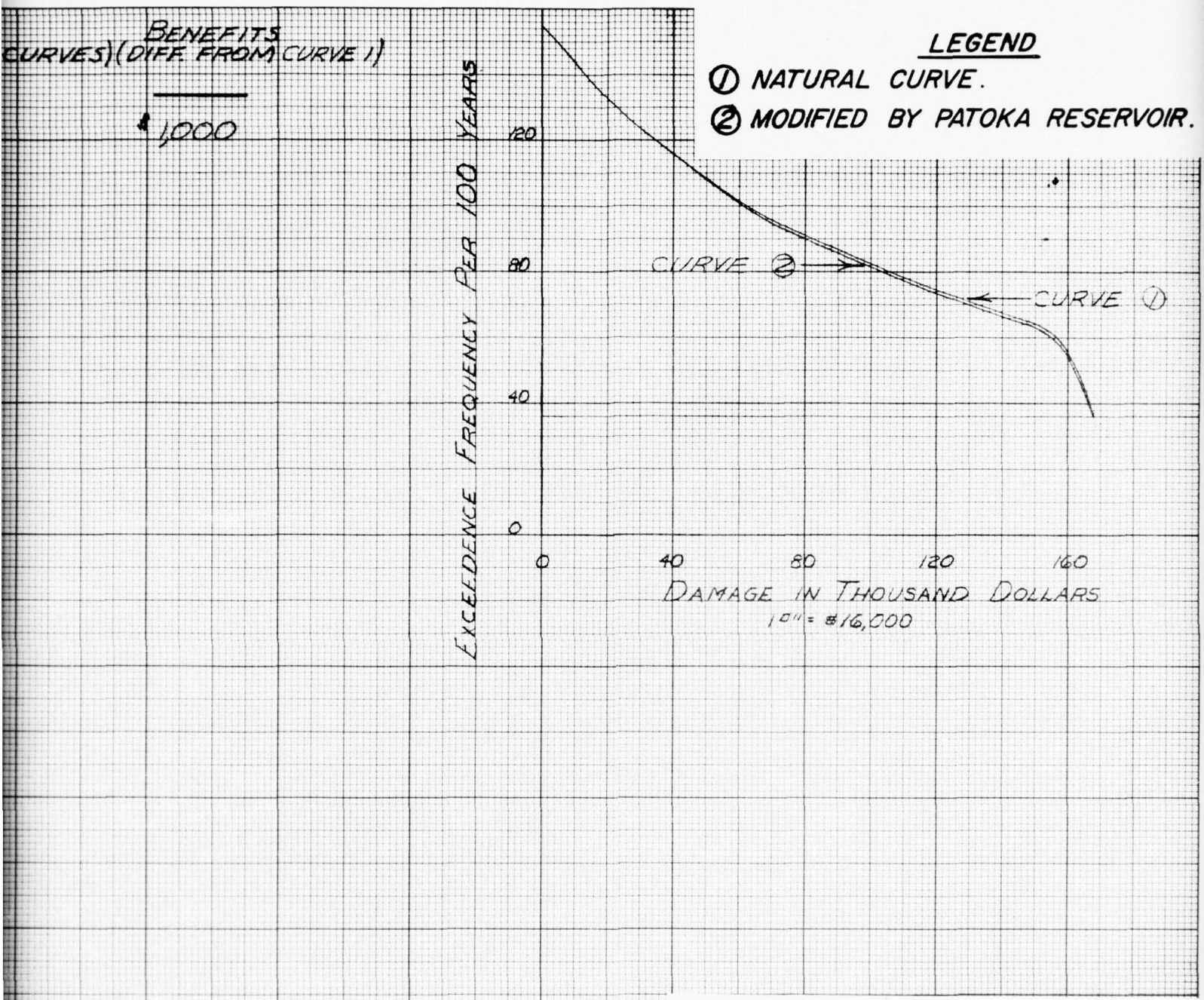
BENEFITS
CURVES) (DIFF. FROM CURVE 1)

$ 1,000

LEGEND

① NATURAL CURVE.

② MODIFIED BY PATOKA RESERVOIR.



WABASH RIVER BASIN

FREQUENCY DAMAGE CURVES
PATOKA RIVER

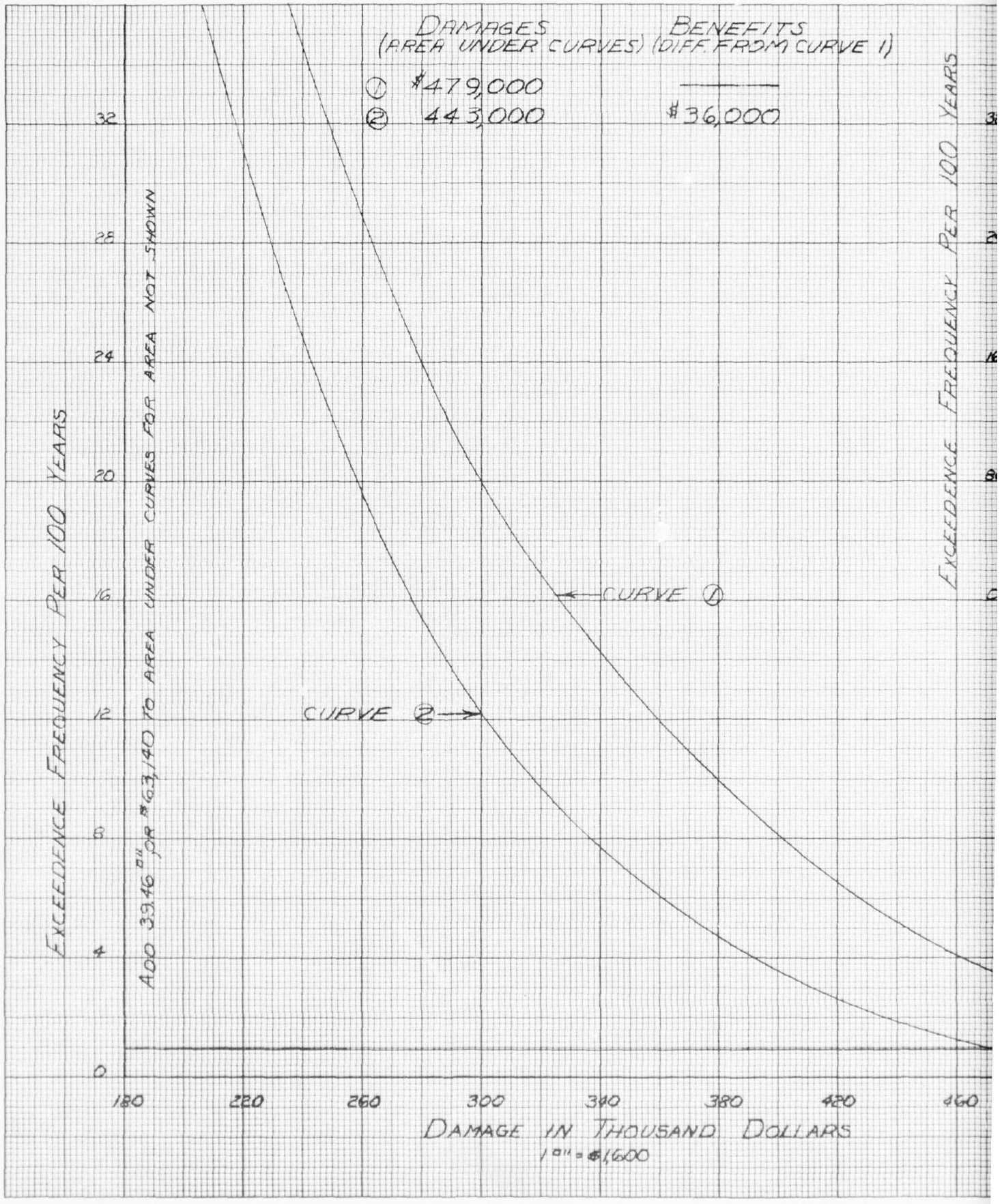
REACH I

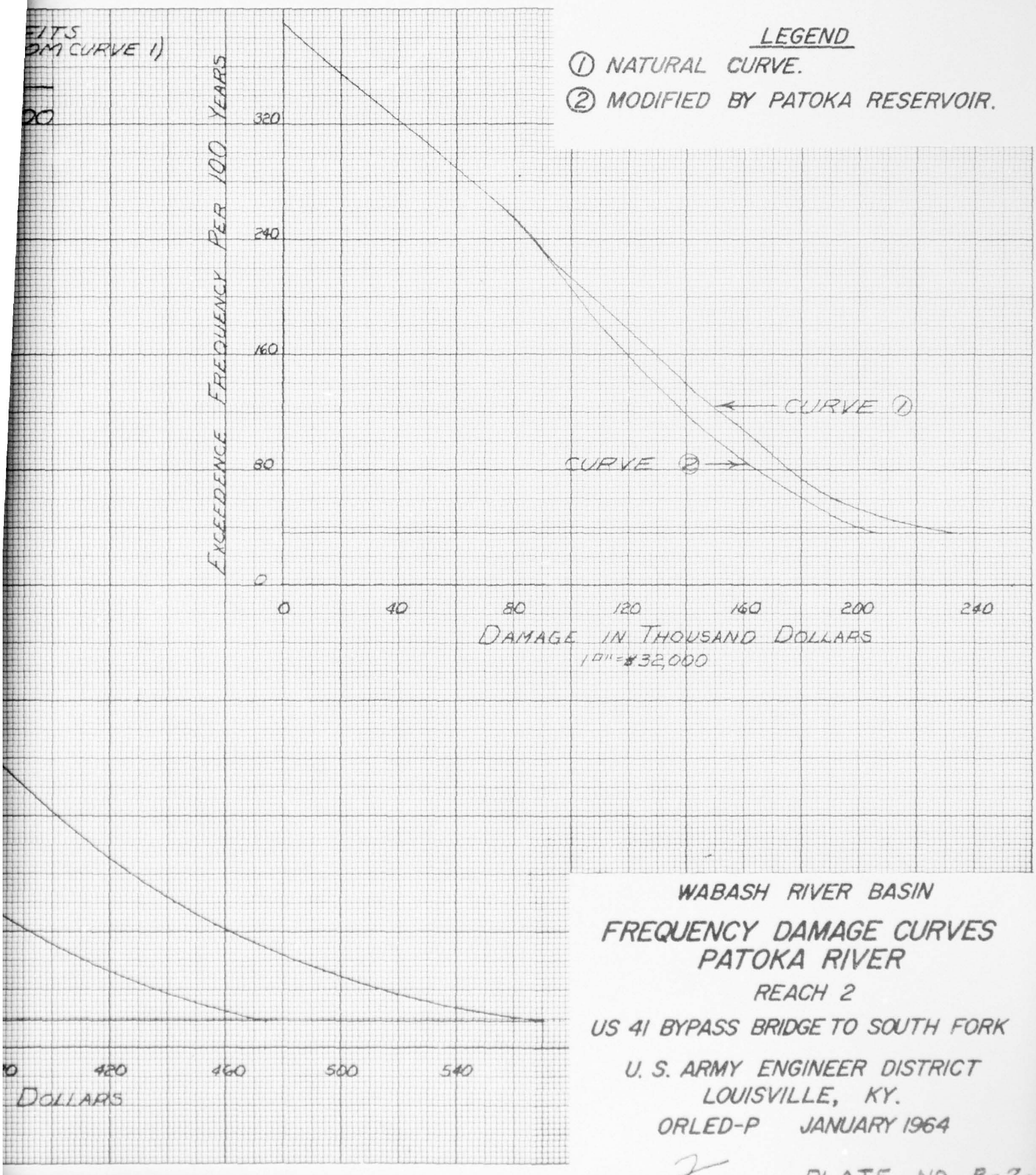
MOUTH TO US 41 BYPASS BRIDGE

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

ORLED-P JANUARY 1964

PLATE NO. B-7p


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $479,000
② 443,000
$36,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 39.46" OR $63,140 TO AREA UNDER CURVES FOR AREA NOT SHOWN
CURVE ①
CURVE ②
32
28
24
20
16
12
8
4
0
180
220
260
300
340
380
420
460
DAMAGE IN THOUSAND DOLLARS
1" = $1,600



WABASH RIVER BASIN

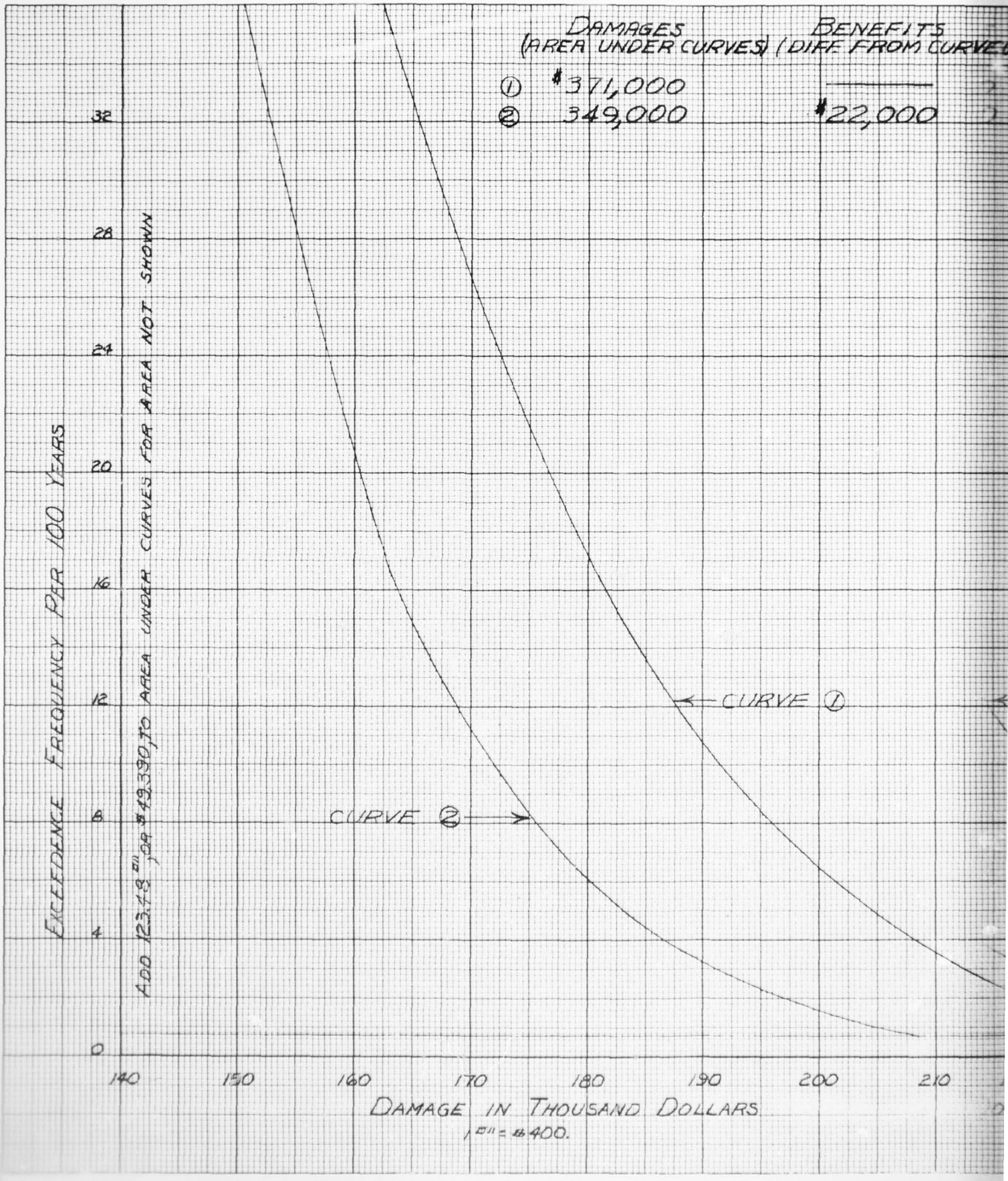
FREQUENCY DAMAGE CURVES PATOKA RIVER

REACH 2

US 41 BYPASS BRIDGE TO SOUTH FORK

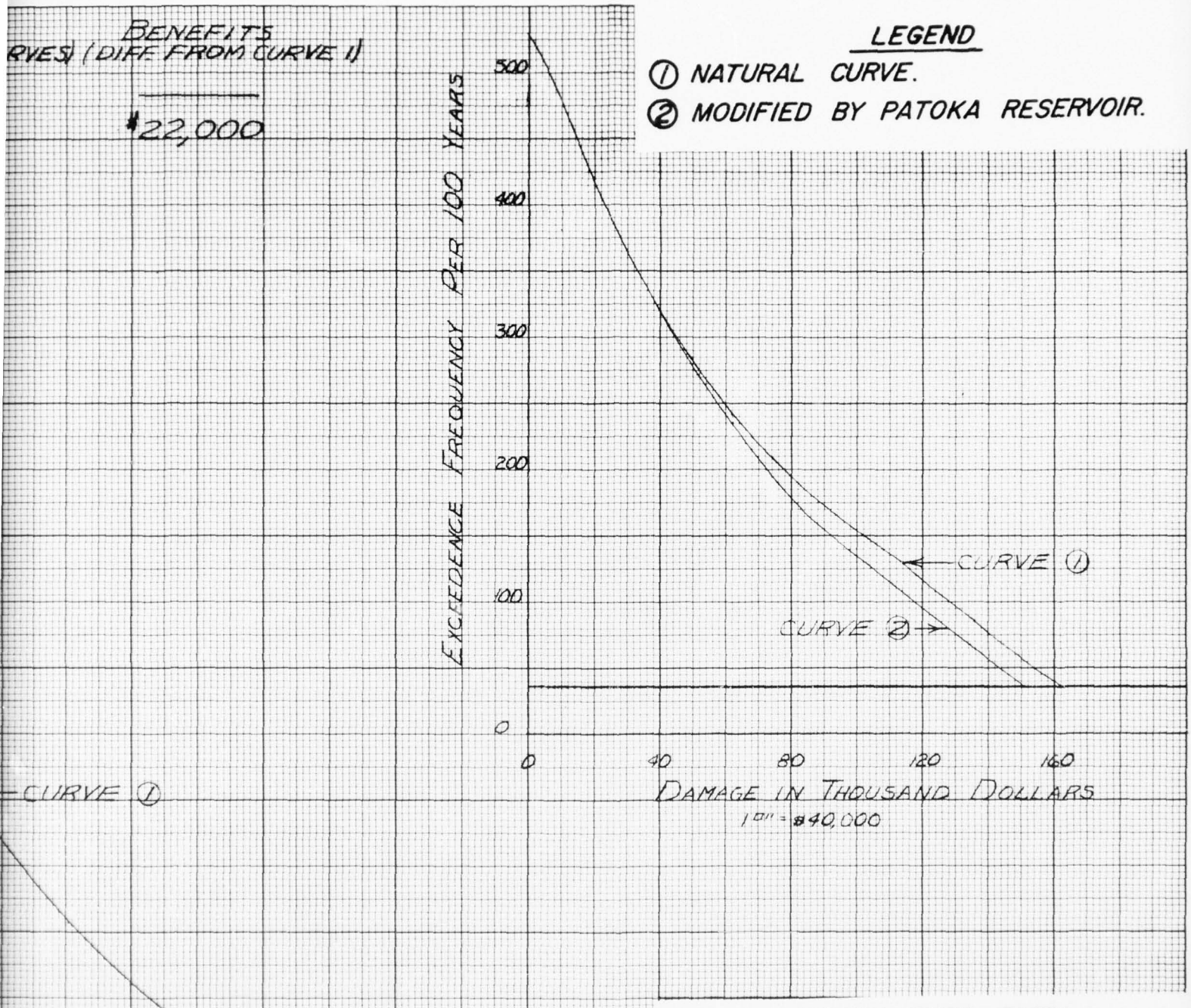
U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-7


DAMAGES (AREA UNDER CURVES)
BENEFITS / DIFF FROM CURVE
① $371,000
② 349,000
$22,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 123.19 FOR $49,390 TO AREA UNDER CURVES FOR AREA NOT SHOWN
32
28
24
20
16
12
8
4
0
CURVE ①
CURVE ②
140
150
160
170
180
190
200
210
DAMAGE IN THOUSAND DOLLARS
1" = $400.

BENEFITS
RVES) (DIFF FROM CURVE 1)

$22,000



-CURVE ①

90 200 210 220 230

LARS

WABASH RIVER BASIN

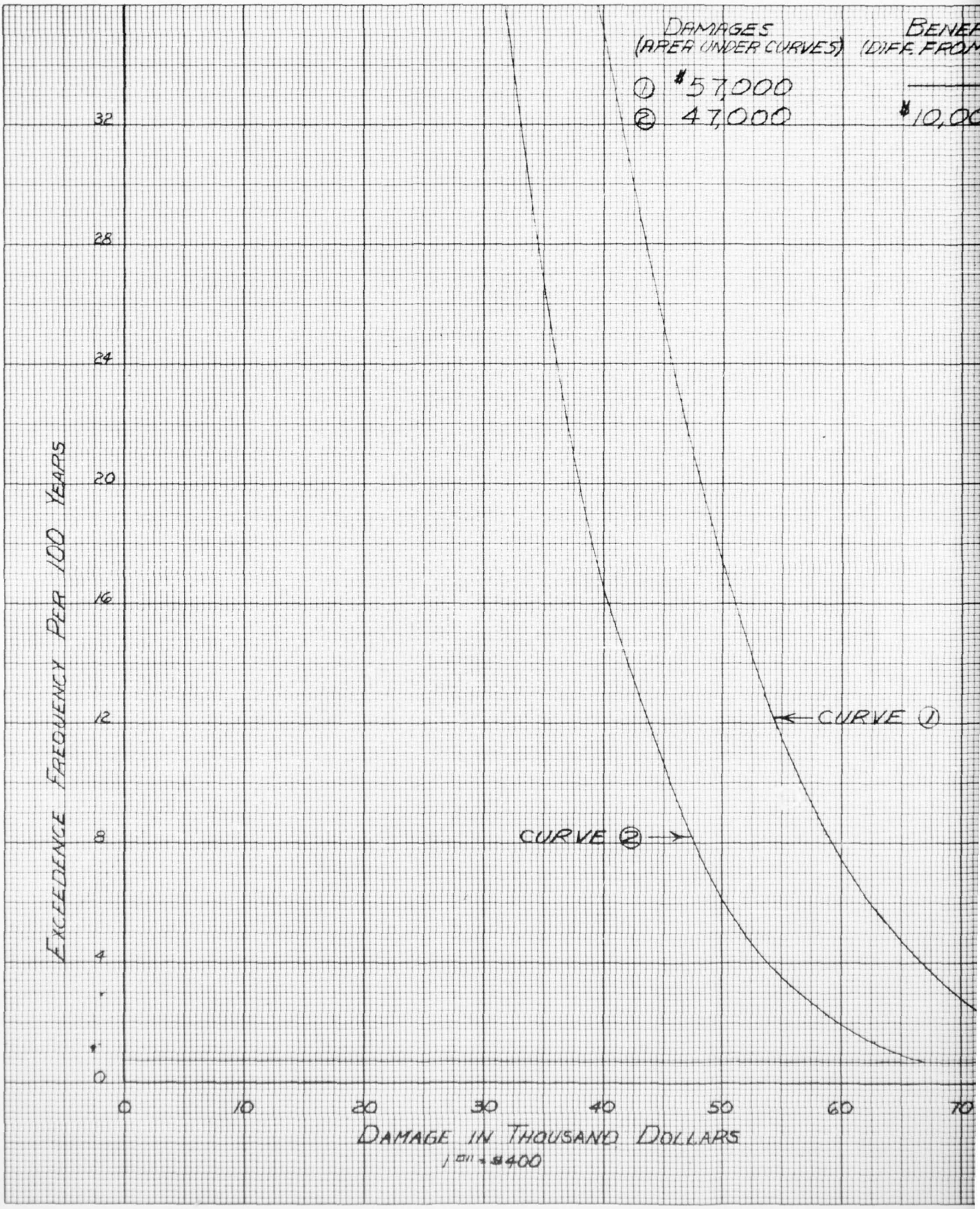
FREQUENCY DAMAGE CURVES PATOKA RIVER

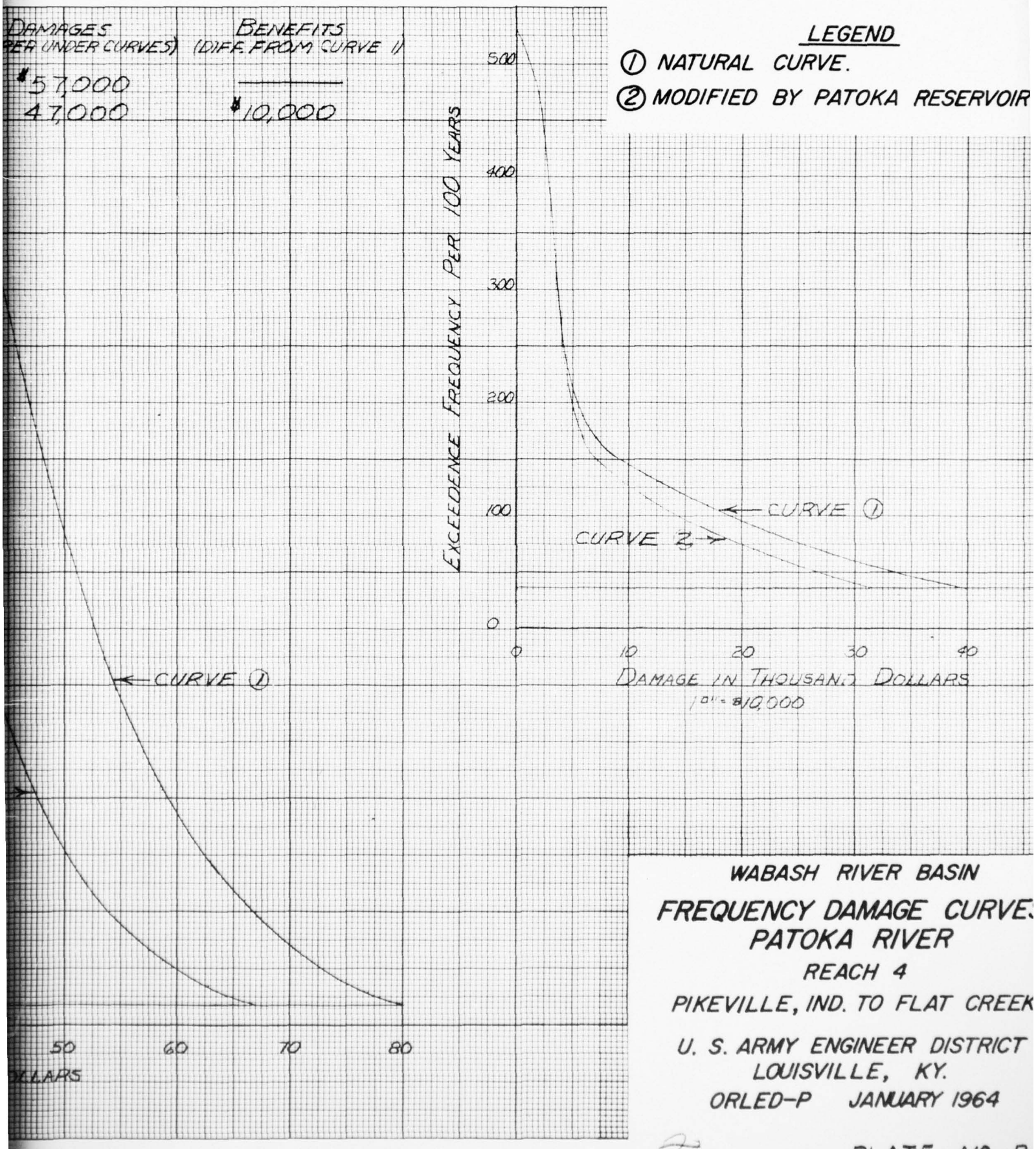
REACH 3

SOUTH FORK TO PIKEVILLE, IND.

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-7R


DAMAGES
(AREA UNDER CURVES)
BENEF
(DIFF. FROM
① $57,000
② 47,000
$10,00
32
28
24
20
16
12
8
4
0
EXCEEDENCE FREQUENCY PER 100 YEARS
CURVE ①
CURVE ②
0
10
20
30
40
50
60
70
DAMAGE IN THOUSAND DOLLARS
1 cm = $400



WABASH RIVER BASIN

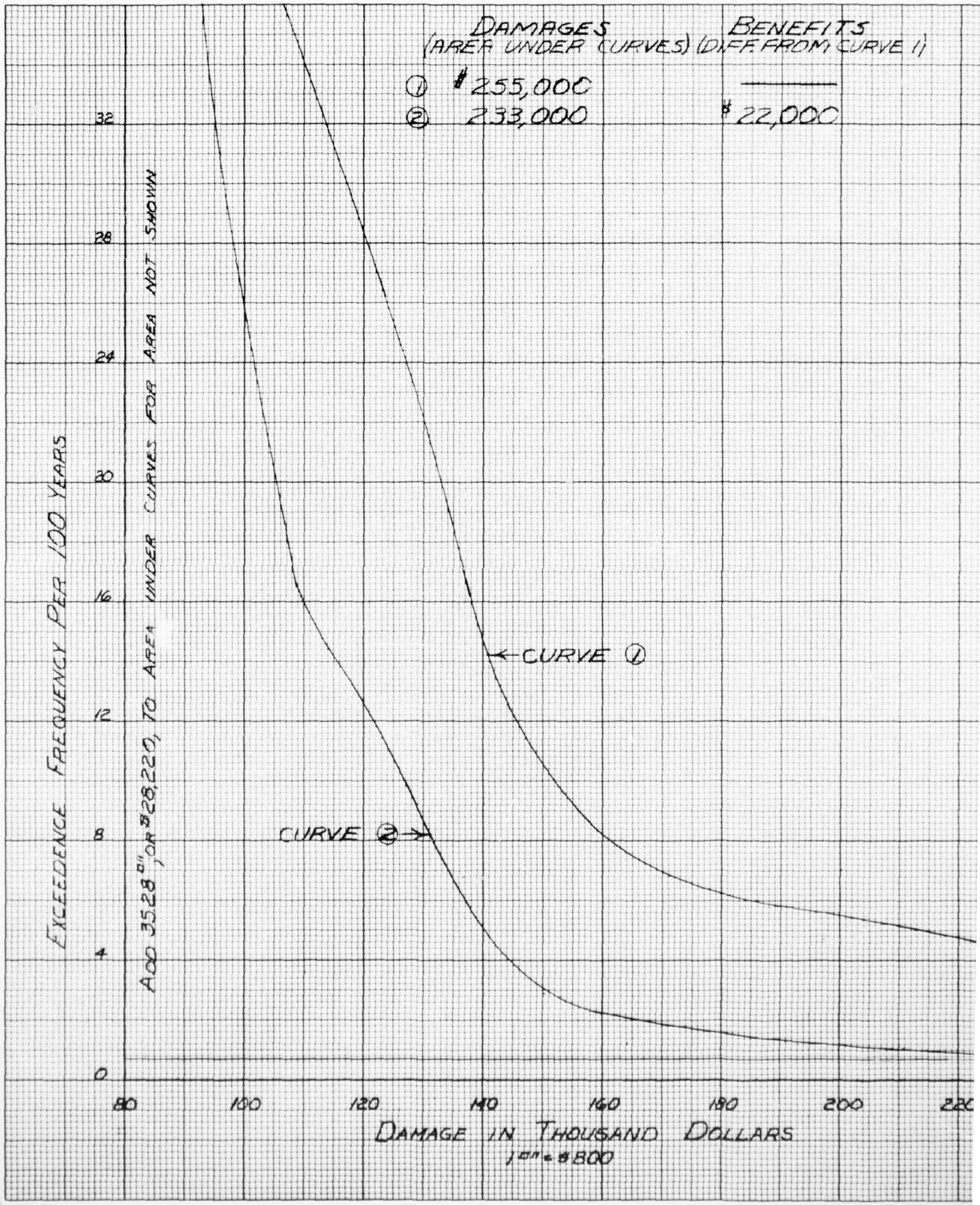
FREQUENCY DAMAGE CURVES
PATOKA RIVER

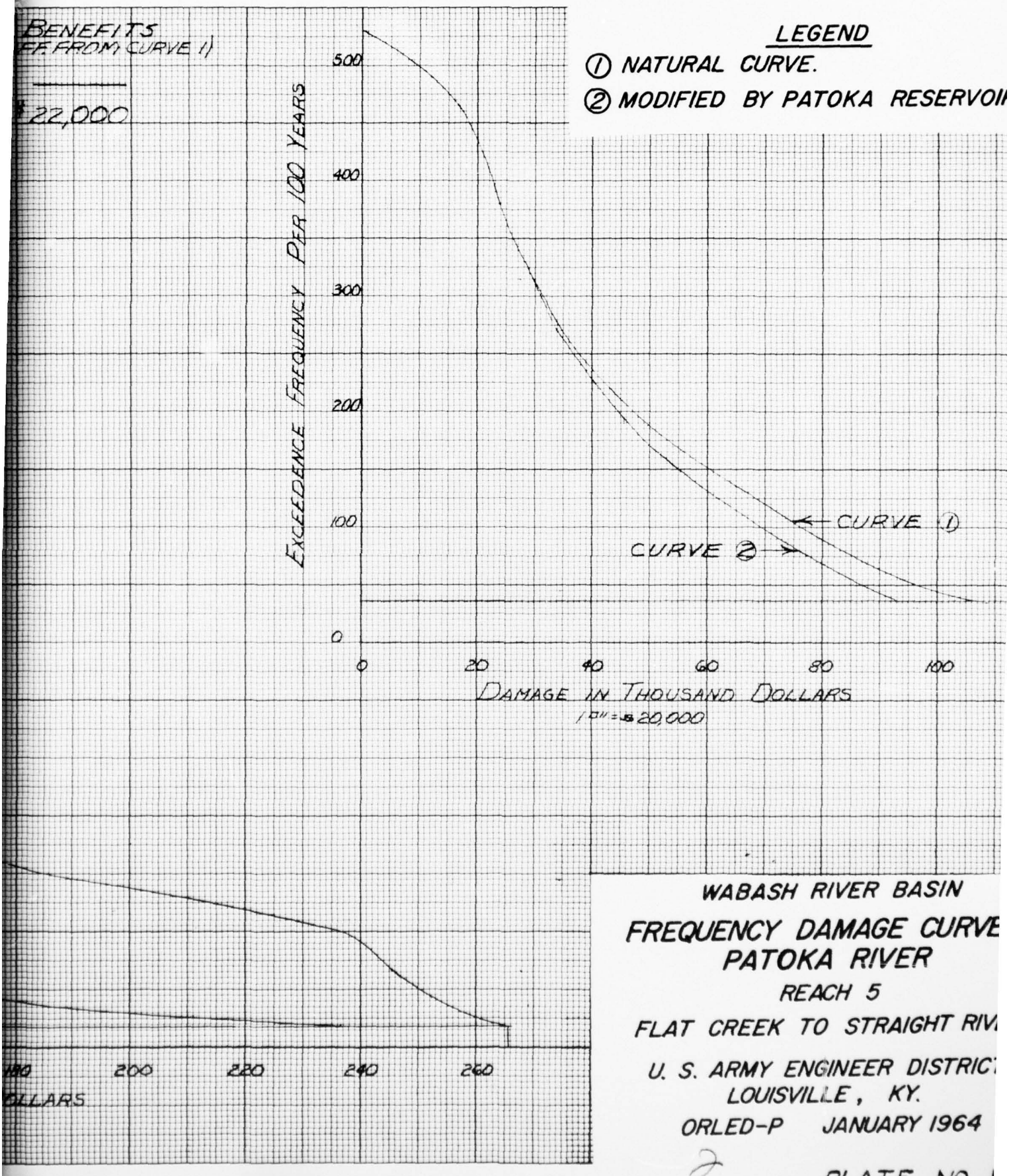
REACH 4

PIKEVILLE, IND. TO FLAT CREEK

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO. B-


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE 1)
① $255,000
② 233,000
$22,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 35.28" OR $28,220, TO AREA UNDER CURVES FOR AREA NOT SHOWN
0
4
8
12
16
20
24
28
32
80
100
120
140
160
180
200
220
CURVE ①
CURVE ②
DAMAGE IN THOUSAND DOLLARS
1" = $800

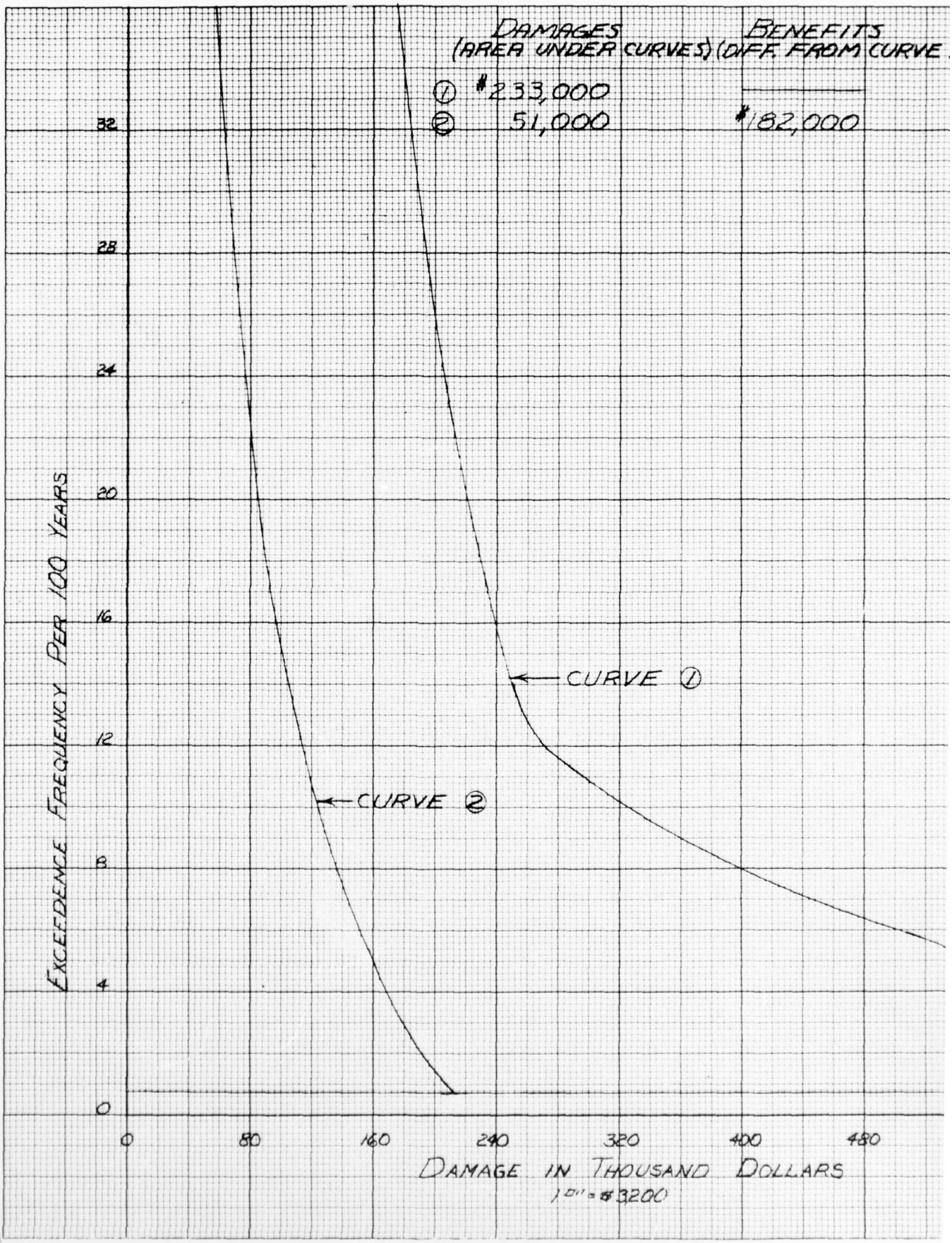


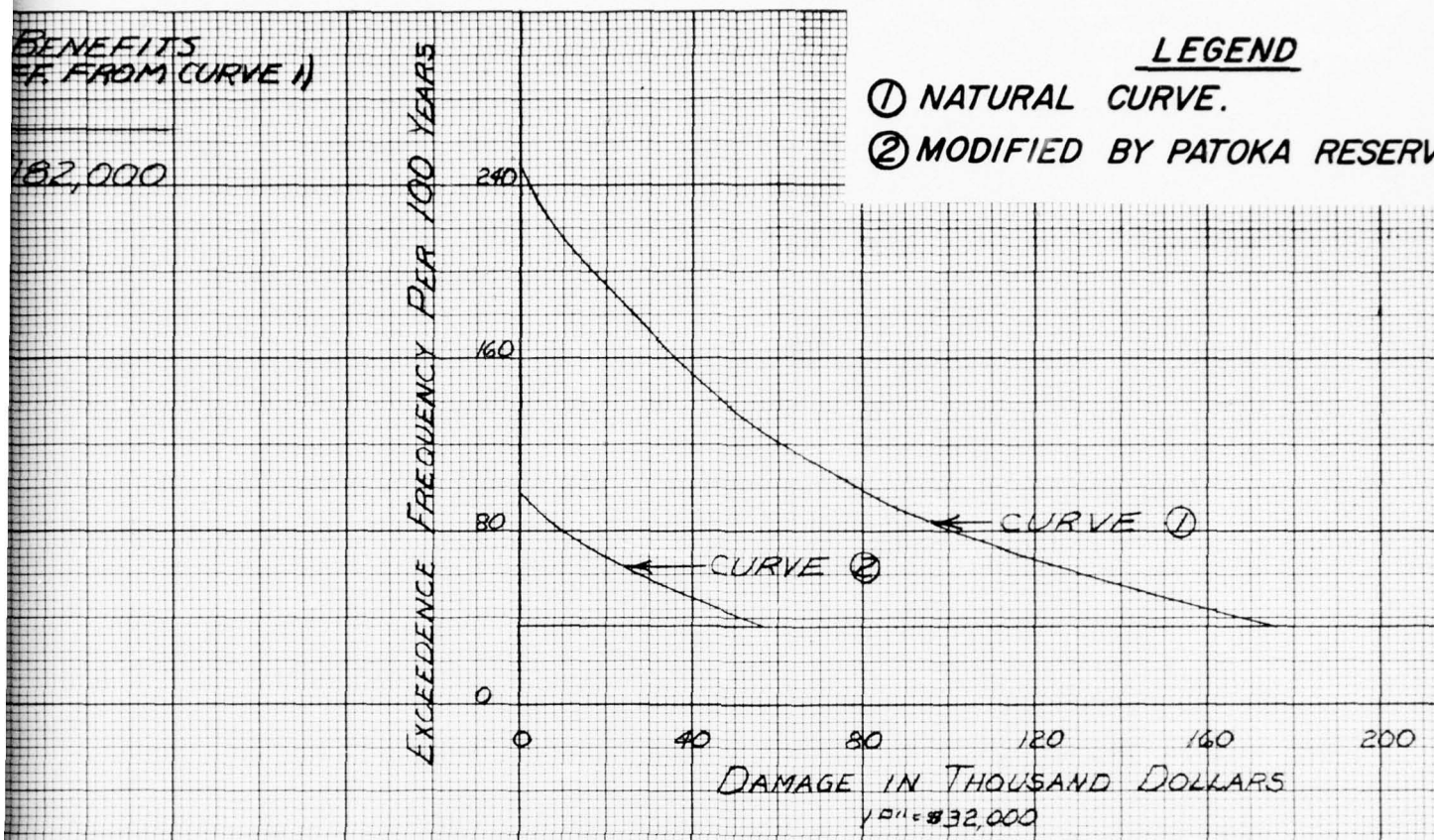
WABASH RIVER BASIN

FREQUENCY DAMAGE CURVE
PATOKA RIVER
REACH 5
FLAT CREEK TO STRAIGHT RIV

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLED-P JANUARY 1964

PLATE NO.

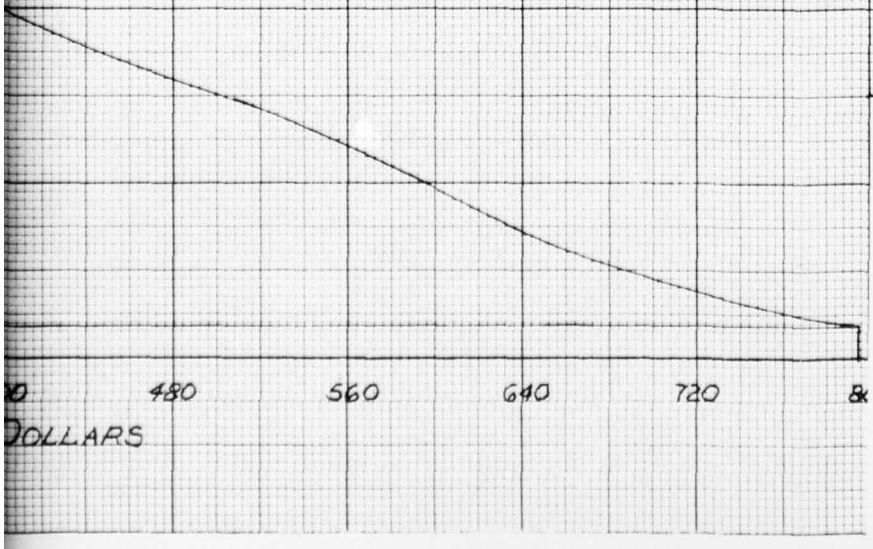

DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CURVE
① $233,000
② 51,000
$182,000
32
28
24
20
16
12
8
4
0
EXCEEDENCE FREQUENCY PER 100 YEARS
CURVE ①
CURVE ②
0
80
160
240
320
400
480
DAMAGE IN THOUSAND DOLLARS
1" = $3200



LEGEND

① NATURAL CURVE.

② MODIFIED BY PATOKA RESERV



WABASH RIVER BASIN

FREQUENCY DAMAGE CUR
PATOKA RIVER

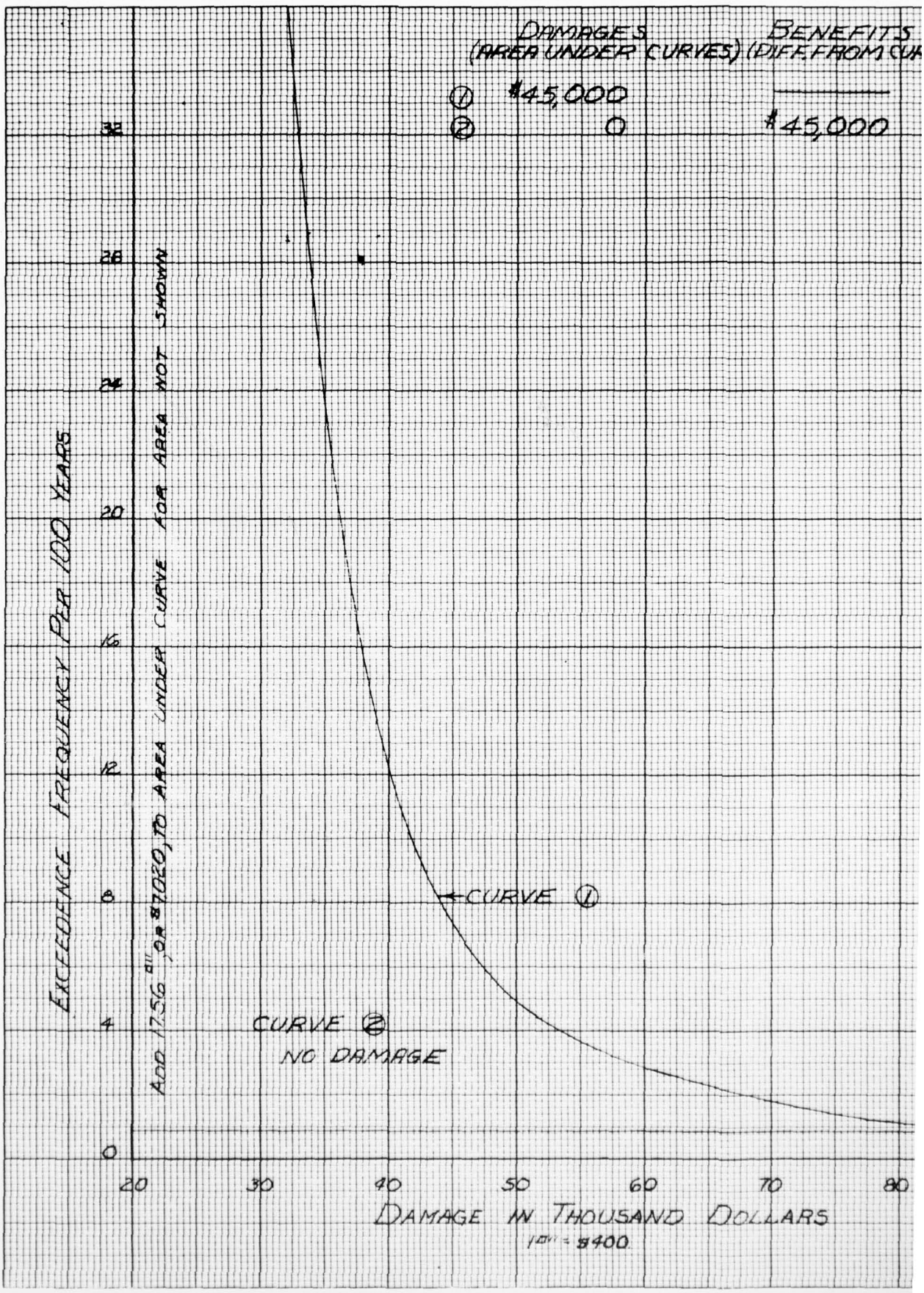
REACH 6

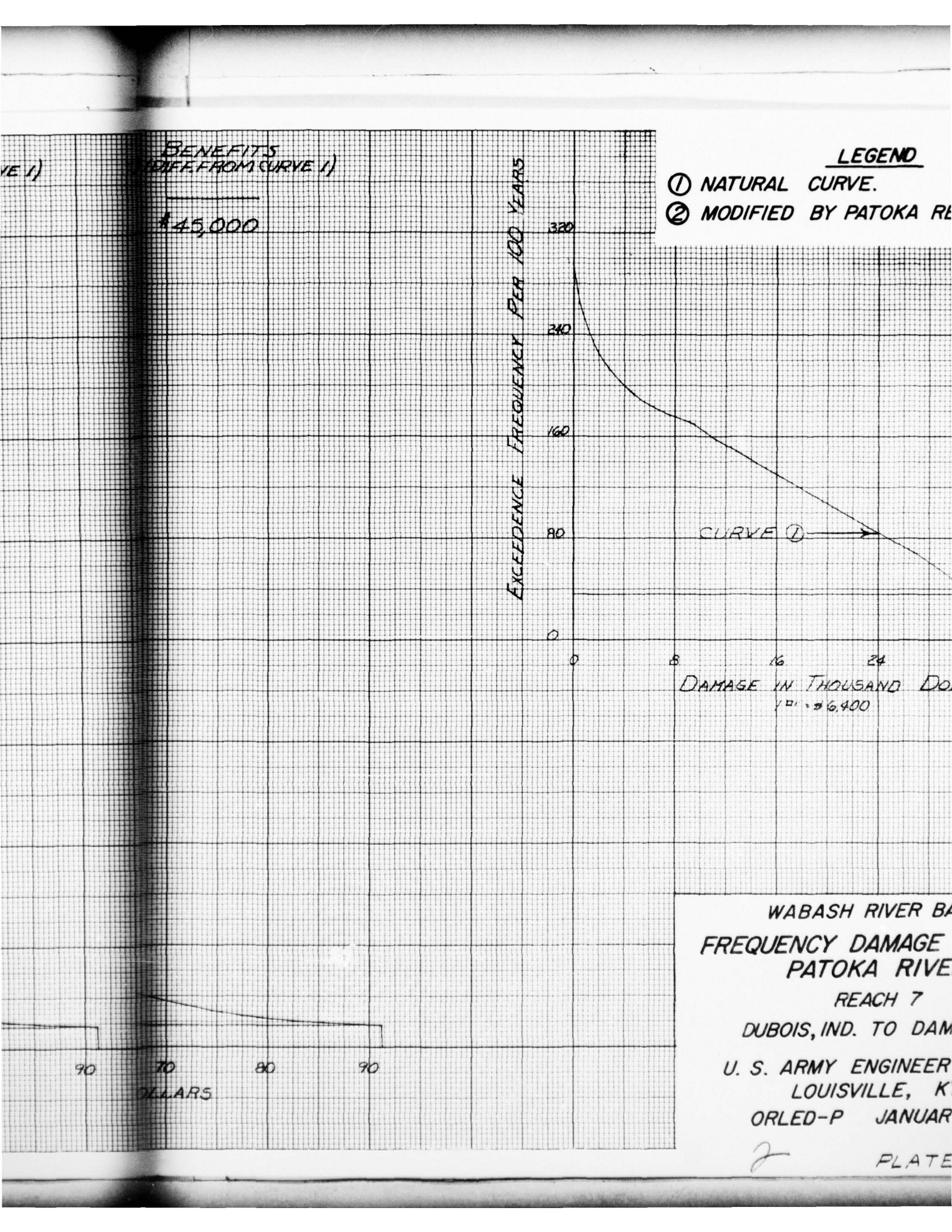
STRAIGHT RIVER TO DUBOIS,

U. S. ARMY ENGINEER DISTRI
LOUISVILLE, KY.

ORLED-P JANUARY 196

2 PLATE NO.


DAMAGES (AREA UNDER CURVES)
BENEFITS (DIFF. FROM CUR
① $45,000
② 0
$45,000
EXCEEDENCE FREQUENCY PER 100 YEARS
ADD 17.5% OR $7020, TO AREA UNDER CURVE FOR AREA NOT SHOWN
32
28
24
20
16
12
8
4
0
CURVE ①
CURVE ②
NO DAMAGE
20
30
40
50
60
70
80
DAMAGE IN THOUSAND DOLLARS
1 cm = $400


VE 1)
BENEFITS
DIFF. FROM CURVE 1)
$45,000
LEGEND
① NATURAL CURVE.
② MODIFIED BY PATOKA RE
EXCEEDENCE FREQUENCY PER 100 YEARS
320
240
160
80
0
CURVE ①
0
8
16
24
DAMAGE IN THOUSAND DO
$6,400
90
70
80
90
DOLLARS
WABASH RIVER BA
FREQUENCY DAMAGE
PATOKA RIVE
REACH 7
DUBOIS, IND. TO DAM
U. S. ARMY ENGINEER
LOUISVILLE, K
ORLED-P JANUAR
PLATE

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS
LOUISVILLE, KENTUCKY

INTERIM REPORT NO. 2
WABASH RIVER BASIN
COMPREHENSIVE STUDY
COVERING RESERVOIR SITES
ON
EMBARRASS RIVER, ILLINOIS
AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA

APPENDIX C

COST ALLOCATION AND APPORTIONMENT

JANUARY 1964

INTERIM REPORT NO. 2
WABASH RIVER BASIN
COMPREHENSIVE STUDY
COVERING RESERVOIR SITES
ON
EMBARRASS RIVER, ILLINOIS
AND
CLIFTY CREEK AND PATOKA RIVER, INDIANA

APPENDIX C

COST ALLOCATION AND APPORTIONMENT

Table of Contents

Rev 16 Mar

TABLES

APPENDIX C

COST ALLOCATION AND APPORTIONMENT

1. ALLOCATION OF COSTS BETWEEN PURPOSES. a. Gene
of costs for each reservoir project was made to obt
distribution of costs among the purposes served. P
allocated by the separable costs - remaining benefi
provides an equitable distribution among purposes b
costs allocated to each purpose from exceeding its
tive costs, whichever is lower, (b) requiring each
least its separable cost, and (c) between these lim
sharing of the savings resulting from multiple purp
The separable cost of each project purpose is the d
the cost of the multiple purpose project and the co
with that purpose omitted. Triple costs are those
the project purposes but not by other purposes in t
fic costs are costs of physically identifiable faci
one purpose. Joint-use costs are for facilities sh
project purposes, such as the dam structure. The c
each reservoir are presented in tables 1 through 11
include the initial plus future increments of gener
development.

b. Investment Costs. Investment costs are th
first costs and the accrued interest during the con
the project. This interest was computed by multipl
cost of the project by a three percent interest rat
the construction period. The estimated constructio
posed projects was assumed to be four years. Detai
first costs of each of the projects are given in Ap

c. Annual Costs. (1) General. For the purp
tion and cost allocation studies, investment costs
tenance and major replacement costs must be reduced
basis. In allocation of costs for multiple purpose
annual equivalent amount was computed in the follow

(2) Interest and Amortization. The inves
duced to their average annual equivalent by conside
amortization of the initial investment. An interes
cent and an amortization period of 100 years was us
tions. For the future incremental investment in re
the interest and amortization was reduced to a pres
vestment factor of 0.65047. This was computed on t
sary investment following the accelerated growth cu
puting the average annual benefits of the future in

(3) Operation and Maintenance. Estimate
tion and maintenance costs for the dam and reservo
recreation are based upon actual experience in the

AD-A036 532 ARMY ENGINEER DISTRICT LOUISVILLE KY F/G 8/6
WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES--ETC(U)
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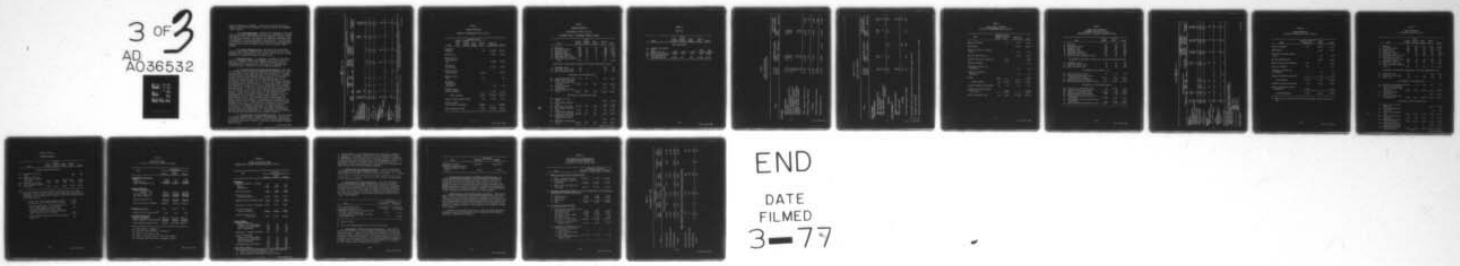

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District, Louisville, Kentucky. Costs for the future increment of general recreation were discounted to present value by the investment factor 0.65047.

(4) Major Replacement. Certain major components of the dam, such as electrical and mechanical equipment, are considered to require replacement 50 years after the project is completed. General recreation facilities having a cost equal to one-third of the initial costs are considered to require replacement every 25 years. The estimated future costs of these replacements were converted to an average annual equivalent value over the entire project life by compound interest methods.

(5) Annual Financial Costs. The sum of the above items gives the total annual financial costs which differs from the annual economic costs by the amount of the economic cost of the loss of land productivity anticipated during the project life.

d. Alternative Costs. (1) General. Estimates of alternative costs for individual single purpose projects were used in the cost allocation studies as a basis for limiting the benefits and for identification of separable costs. The basis for computing these alternative costs is described in the following paragraphs.

(2) Alternative Cost of Single Purpose Projects. The bases for estimating costs of alternative projects for flood control, water quality control, water supply and general recreation were; (a) that the alternatives would supply the same level of benefits as provided by these purposes in the multiple purpose projects; (b) that the alternatives considered are the most economical projects to be developed for these purposes; and (c) that the alternatives proposed be feasible and even probable in the absence of the proposed projects. The determination of the alternative, or opportunity costs, measures the economic cost foregone by including the purposes in the multiple purpose project. In the case of flood control, these alternate projects were assumed to be at the site of the proposed multiple purpose project. In the case of water supply and water quality control storage included in the Patoka Reservoir, the alternative cost was determined by construction of a single purpose reservoir at the Patoka Reservoir site. The alternative cost of water supply and water quality control storage at the proposed Lincoln Reservoir was computed on the basis of single purpose reservoirs located near the proposed project site. In all cases the alternative cost of general recreation was determined by multiplying the expected number of visitor days, as furnished by the Bureau of Outdoor Recreation, by the value that state park systems have spent and/or are willing to spend for general recreation projects. Alternative costs for general and fish and wildlife recreation are developed in table 10.

(3) Alternate Dual and Tri-Purpose Projects. For the purpose of deriving separable costs, a series of estimates were prepared for each multiple purpose project with one purpose omitted. Each estimate was based on these cost estimates at the site of the proposed multiple purpose project.

TABLE 1
LINCOLN RESERVOIR PROJECT - SUMMARY OF COSTS
($1,000)

Item	Multiple purpose project	Alternative Projects: Flood control 1/	Alternative Projects: Water quality control, 1,800 acre-feet	Alternative Projects: Water supply 800 acre-feet	Alternative Projects: Recreation	Alternate Tri-Purpose Projects: Flood control water supply recreation, multiple purpose project less 4,500 acre-feet	Alternate Tri-Purpose Projects: Flood control water quality control recreation, multiple purpose project less 3,500 acre-feet	Alternate Tri-Purpose Projects: Flood control water quality control water supply	Alternate Tri-Purpose Projects: Water quality control water supply recreation
Investment									
Lands and damages	12,000	12,000						12,000	3,234
Relocations	9,348	9,348						9,348	4,700
Reservoir and pool preparation	2,045	2,045						2,045	300
Dam and appurtenances	4,150	4,150						4,150	1,250
General recreation (initial) 2/	2,840								2,840
Fish and wildlife recreation	143								143
Buildings, grounds and utilities	114	114						114	114
Permanent operating equipment	80	80						80	80
Total first cost (initial rec.)	30,720	27,737	900	400		30,459 3/	30,517 3/	27,737	12,665
Interest during construction	1,843	1,664	27	12		1,828	1,831	1,664	760
Subtotal	32,563	29,401	927	412		32,287	32,348	29,401	13,425
General Recreation (future)	2,280					2,280	2,280		2,280
Total Investment Costs	34,843	29,401	927	412		34,567	34,628	29,401	15,705
Annual Charges									
Initial Recreation									
Interest and amortization	1,031	931	29	13		1,022	1,024	931	425
O&M - Dam structure	40	35	15	10		40	40	40	20
- Recreation	104					104	104		104
Major replacement - Dam structure	3	3				3	3	3	3
- Recreation	18					18	18		18
Subtotal	1,196	969	44	23	388	1,187	1,189	974	570
Future Increment 4/									
Interest and amortization	47					47	47		47
O&M	91					91	91		91
Major replacement	12					12	12		12
Subtotal	150				334	150	150		150
Total Annual Financial Charges	1,346	969	44	11 5/	722	1,337	1,339	974	720

1/ Alternative flood control project at site of multiple purpose project.
2/ Includes lands required.
3/ Separable cost based on $58.00 per acre foot construction cost of Lincoln Reservoir.
4/ Future increment charges discounted to present value by investment factor = 0.65047.
5/ Water supply is future need 25 years after project initiated. Discounted to present value (factor = 0.4776).

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TABLE 2

LINCOLN RESERVOIR

SUMMARY OF INVESTMENT COSTS ($1,000)

Item	Specific costs				Joint use facilities	Total
	Flood control	Water quality control	Water supply	Recreation		
Lands and damages				800	12,000	12,800
Relocations					9,348	9,348
Reservoir and pool preparation					2,045	2,045
Dam and appurtenances					4,150	4,150
General recreation (init.)				2,040		2,040
Fish and wildlife				143		143
Buildings, grounds and utilities					114	114
Permanent operating equipment					80	80
Total initial				2,983	27,737	30,720
Interest during construction				179	1,664	1,843
General recreation (future increment)				2,280		2,280
Total Investment Costs				5,442	29,401	34,843

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TABLE 3

LINCOLN RESERVOIR

ALLOCATION OF COSTS ($1,000)

SEPARABLE COSTS - REMAINING BENEFITS METHOD

	Item	Flood control	Water quality control	Water supply	Recreation	Total
1.	Benefits	1,890	44	11	964	2,909
2.	Alternative costs	969	44	11	722	1,746
3.	Benefits limit	969	44	11	722	1,746
4.	Separable costs	626	9	7	372	1,014
5.	Remaining benefits	343	35	4	350	732
6.	Allocated joint costs	155	16	2	159	332
7.	Total allocated financial costs	781	25	9	531	1,346
	Allocation of Operation, Maintenance and Major Replacement Costs					
8.	Separable costs	20			225	245
9.	Allocated joint costs	11	1		11	23
10.	Total allocated costs	31	1		236	268
	Allocation of Investment Costs					
11.	Annual investment costs	750	24	9	295	1,078
12.	Capitalized investment costs (increment discounted)	23,687	758	284	9,317	34,046
13.	Discount (future increment)	-	-	-	797	797
14.	Total capitalized inv. costs	23,687	758	284	10,114	34,843
	Allocation of Construction Costs					
15.	Specific use inv. costs				5,442	5,442
16.	Int. during construction				179	179
17.	Joint use inv. costs	23,687	758	284	4,672	29,401
18.	Int. during construction	1,341	43	16	264	1,664
19.	Construction costs of joint use facilities	22,346	715	268	4,408	27,737
20.	Construction costs of specific use facilities				5,263	5,263
21.	Allocated construction costs	22,346	715	268	9,671	33,000

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TABLE 3

(Cont'd)

Item	Flood control	Water quality control	Water supply	Recreation	Total
		ARA Cost Offset			
22. Specific use facilities				271	271
23. Ratio (line 19)	(.8056)	(.0258)	(.0097)	(.1589)	(1.0000)
24. Joint use facilities	1,572	50	19	311	1,952
25. Net allocated construction costs	20,774	665	249	9,089	30,777

TABLE 4

CLIFTY CREEK RESERVOIR
SUMMARY OF COSTS ($1,000)

Item	Multiple purpose project	Alternative projects		Alternate single purpose projects	
		Flood control 1/	Recreation	Flood control	Recreation
Investment					
Lands and damages	1,624	1,624		1,624	
Relocations	2,600	2,600		2,600	
Reservoir and pool preparation	161	161		161	
Dam and appurtenances	7,357	7,357		7,357	
General recreation (initial) 2/	1,456				
Fish and wildlife recreation	127				
Buildings, grounds and utilities	115	115		115	
Permanent operating equipment	86	86		86	
Levees	334	334		334	
Total first cost (initial rec.)	13,860	12,277		12,277	7,200
Interest during construction	832	737		737	432
Subtotal	14,692	13,014		13,014	7,632
General recreation (ultimate)	2,040				2,040
Total Investment Cost	16,732	13,014	4,455	13,014	9,672

TABLE 4 (CONT'D)

CLIFTY CREEK RESERVOIR

Item	Multiple purpose projects	Alternative projects		Alternate single purpose projects	
		Flood control 1/	Recreation	Flood control	Recreation
Annual Charges					
Initial Recreation					
Interest and amortization	465	412		412	242
O&M - Dam structure	35	35		35	15
O&M - Recreation	58				58
Major replacement - Dam structure	7	7		7	3
- Recreation	11				11
Subtotal	576	454	116	454	329
Future Increment 3/					
Interest and amortization	42				42
O&M	78				78
Major replacement	11				11
Subtotal	131		203		131
Total Annual Financial Charges	707	454	319	454	460

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1/ Alternative flood control project at site of multiple purpose project

2/ Includes lands required

3/ Future increment charges discounted to present value by investment factor = 0.65047

TABLE 5

CLIFTY CREEK RESERVOIR
SUMMARY OF INVESTMENT COSTS ($1,000)

Item	Specific costs		Joint use facilities	Total
	Flood control	Recreation		
Lands and damages		186	1,624	1,810
Relocations			2,600	2,600
Reservoir and pool preparation			161	161
Dam and appurtenances			7,357	7,357
General recreation (initial)		1,270		1,270
Fish and wildlife		127		127
Buildings, grounds and utilities			115	115
Permanent operating equipment			86	86
Levees	334			334
Total initial	334	1,583	11,943	13,860
Interest during construction	20	95	717	832
General recreation (future increment)		2,040		2,040
Total Investment Costs	354	3,718	12,660	16,732

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TABLE 6

CLIFTY CREEK RESERVOIR
ALLOCATION OF COSTS ($1,000)
SEPARABLE COSTS - REMAINING BENEFITS METHOD

	Item	Flood control	Recreation	Total
1.	Benefits	550	617	1,167
2.	Alternative costs	454	319	773
3.	Benefits limit	454	319	773
4.	Separable cost	247	253	500
5.	Remaining benefits	207	66	273
6.	Allocated joint costs	157	50	207
7.	Total allocated financial costs	404	303	707
	Allocation of Operation, Maintenance and Major Replacement Costs			
8.	Separable costs	14	158	182
9.	Allocated joint costs	24	4	18
10.	Total allocated costs	38	162	200
	Allocation of Investment Costs			
11.	Annual investment costs	366	141	507
12.	Capitalized investment costs (increment discounted)	11,564	4,455	16,019
13.	Discount (future increment)	-	713	713
14.	Total capitalized investment costs	11,564	5,168	16,732
	Allocation of Construction Costs			
15.	Specific use investment costs	354	3,718	4,072
16.	Interest during construction	20	95	115
17.	Joint use investment costs	11,210	1,450	12,660
18.	Interest during construction	635	82	717
19.	Construction costs of joint use facilities	10,575	1,368	11,943
20.	Construction costs of specific use facilities	334	3,623	3,957
21.	Total allocated construction costs	10,909	4,991	15,900

TABLE 7
PATOKA RESERVOIR - SUMMARY OF COSTS
($1,000)

Item	Multiple purpose project	Alternative Single Purpose Projects				Alternate tri-purpose projects			
		Flood control	Water quality control	Water supply	Recreation	Flood control water quality control water supply	Flood control water supply recreation, multiple purpose project less 14,800 acre-feet 2/	Flood control water quality control recreation, multiple purpose project less 14,800 acre-feet 2/	Water quality control water supply recreation
First Cost									
Lands and damages	2,850	1,400				2,850	2,651	2,651	1,590
Relocations	5,923	2,154				5,923	5,823	5,823	2,794
Reservoir and pool preparation	919	650				919	919	919	670
Dam and appurtenances	8,241	7,002				8,241	8,100	8,100	7,052
Gen. rec. facilities & lands(initial) 1/	2,085	-				-	2,085	2,085	2,085
Fish and wildlife	228	-				-	228	228	228
Buildings, grounds and utilities	114	114				114	114	114	114
Permanent operating equipment	80	80				80	80	80	80
Subtotal first cost (initial)	20,440	11,400	5,800 3/	9,200 4/		18,127	20,000	20,000	14,613
Interest during construction	1,226	684	174 5/	552		1,088	1,200	1,200	877
Subtotal	21,666	12,084	5,974	9,752		19,215	21,200	21,200	15,490
General Recreation (future)	3,560	-	-	-			3,560	3,560	3,560
Total Investment Cost	25,226	12,084	5,974	9,752		19,215	24,760	24,760	19,050
Annual Charges									
Initial									
Interest and amortization	686	382	189	309		608	671	671	490
Operation & Maintenance - Dam	45	35	30	35		45	45	45	35
- Recreation	96						96	96	96
Major replacement - Dam	3	3				3	3	3	3
- Recreation	16						16	16	16
Subtotal	846	420	219	344	375	656	831	831	640
Future Increment									
Interest & amortization (disc.)	73						73	73	73
Operation and maintenance	131						131	131	131
Major replacement	20						20	20	20
Subtotal	224				446		224	224	224
Total Annual Financial Charges	1,070	420	219	344	821 6/	656	1,055	1,055	864

1/ Includes required lands.

2/ If water quality control or water supply are removed as project purposes seasonal pool of 536' requires conservation pool of 534'. Incremental reduction of construction costs = $440,000, therefore, 20,440,000 - 440,000 = $20,000,000 first cost (initial).

3/ From cost curve at site = 32,000 AF = 68 cfs
13,200 AF = Min. pool
45,200 AF

4/ From cost curve at site = 92,000 AF = 130 cfs
13,200 AF = Min. pool
105,200 AF

5/ Construction period = 2 years = 2 x .03 x .5 = .03

6/ Table 10, Appendix C.

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TABLE 8

PATOKA RESERVOIR
SUMMARY OF INVESTMENT COSTS ($1,000)

Item	Specific costs 1/ Recreation	Joint costs	Total
Lands and damages	210	2,850	3,060
Relocations	-	5,923	5,923
Reservoir and pool preparation	-	919	919
Dam and appurtenances	-	8,241	8,241
General recreation (initial)	1,875	-	1,875
Fish and wildlife	228	-	228
Buildings, grounds and utilities	-	114	114
Permanent operating equipment	-	80	80
Total initial	2,313	18,217	20,440
Interest during construction	139	1,087	1,226
General recreation (future increment)	3,560		3,560
Total Investment	6,012	19,214	25,226

1/ There are no specific costs for Water Supply or Water Quality Control

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TABLE 9

PATOKA RESERVOIR
ALLOCATION OF COSTS ($1,000)

	Item	Flood control	Water quality control	Water supply	Recreation	Total
1.	Benefits	520	219	344	1,149	2,232
2.	Alternative costs	420	219	344	821	1,804
3.	Benefit limit	420	219	344	821	1,804
4.	Separable cost	206	15	15	414	650
5.	Remaining benefits	-	204	329	407	(940)
6.	Allocated triple costs 1/	-	45	72	89	206
7.	Separable cost after allocated triple costs	206	60	87	503	856
8.	Remaining benefits	214	159	257	318	948
9.	Allocated joint cost	48	36	58	72	214
10.	Total allocated financial costs	254	96	145	575	1,070
	Allocation of Operation, Maintenance and Major Replacement Costs					
11.	Separable costs	10			263	273
12.	Allocated joint costs	9	6	10	13	38
13.	Total costs	19	6	10	276	311
	Allocation of Investment Costs					
14.	Allocated investment costs	235	90	135	299	759
15.	Capitalized investment costs (increment discounted)	7,425	2,844	4,266	9,447	23,982
16.	Discount (future increment)				1,244	1,244
17.	Total capitalized investment cost	7,425	2,844	4,266	10,691	25,226
	Allocation of Construction Costs					
18.	Specific use investment cost				6,012	6,012
19.	Interest during construction				139	139
20.	Joint use investment cost	7,425	2,844	4,266	4,679	19,214
21.	Interest during construction	420	161	241	265	1,087
22.	Construction cost of joint facilities	7,005	2,683	4,025	4,414	18,127
23.	Construction cost of specific facilities				5,873	5,873
24.	Total allocated construction costs	7,005	2,683	4,025	10,287	24,000

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TABLE 9 (Cont'd)

PATOKA RESERVOIR

Item	Flood control	Water quality control	Water supply	Recreation	Total
		ARA Construction Cost Offset			
25. Specific use facilities				292	292
26. Ratio of joint use facilities construction cost	.3864	.1480	.2220	.2436	1.000
27. Joint use facilities	638	245	367	403	1,653
28. Net allocated construction cost	6,367	2,438	3,658	9,592	22,055

1/ Allocated triple costs equal residual separable costs of storage allocated to water quality control, water supply and recreation. The incremental cost of adding these purposes to the flood control project at the site are:

Annual costs of multiple purpose project	$1,070
less annual costs of flood control project	420
Triple separable cost of water quality control, water supply, and recreation	650
less assigned separable cost of water quality control, water supply and recreation (line 4) (15 + 15 + 414)	444
Equals residual triple costs to be allocated (line 6)	206

TABLE 10

ALTERNATIVE COSTS
GENERAL AND FISH AND WILDLIFE RECREATION

Item	Reservoir		
	Lincoln	Clifty Creek	Patoka
Recreational Area-Acres			
Lands	5,000	600	4,000
Seasonal Pool	6,760	919	8,880
Total Recreational Area	11,760	1,519	12,880
Annual Attendance			
General Recreation- Initial 1/	425,000	200,000	400,000
Fish and Wildlife 2/	85,000	23,000	121,000
Sub Total- Initial	510,000	223,000	521,000
Future Increment 1/	675,000	600,000	950,000
Total Recreation Attendance	1,186,000	823,000	1,473,000
Attendance Per Acre	101	243 3/	114
Annual Cost Per Visitor Day 4/	$0.76	$0.52	$0.72
Alternate Annual Cost			
Initial Attendance	$388,000	$116,000	$375,000
Future Increment (discounted) 5/	334,000	203,000	446,000
Total Alternate Annual Costs	$722,000	$319,000	$821,000

1/ BOR Estimate - Appendix F
2/ Fish and Wildlife Bureau - Appendix F
3/ Based on all project lands
4/ Based on average costs of State park systems
5/ Discount factor for future increment 0.65195

TABLE 11

SUMMARY OF SPECIFIC COSTS
GENERAL AND FISH AND WILDLIFE RECREATION ($1,000)

Item	Reservoir		
	Lincoln	Clifty Creek	Patoka
Investment			
General recreation - Initial			
Lands	800	186	210
Facilities	2,040	1,270	1,875
Fish and Wildlife	143	127	228
Total first cost - Initial recreation	2,983	1,583	2,313
Interest during construction[1/]	179	95	139
Sub-total - Initial recreation	3,162	1,678	2,452
General recreation - Future increment	2,280	2,040	3,560
Total investment cost-recreation	5,442	3,718	6,012
Annual Charges			
Initial recreation			
Interest and amortization	100	53	77
Operation and maintenance	104	58	96
Major replacement	18	11	16
Sub-total - Initial recreation	222	122	189
Future increment[2/]			
Interest and amortization	47	42	73
Operation and maintenance	91	78	131
Major replacement	12	11	20
Sub-total future recreation	150	131	224
Total Annual Charges	372	253	413

1/ Interest during construction -- ½ of 4 year period @ 3 per cent on initial recreation only

2/ Future increment discounted to AAE (0.65047)

2. APPORTIONMENT OF COSTS BETWEEN FEDERAL AND NON-FEDERAL INTERESTS.
a. General. In accordance with general policy expressed in applicable legislation, the allocated costs for project features incorporated in the multiple-purpose reservoirs have been apportioned to Federal and non-Federal interests to permit a practical and efficient plan of development of the proposed reservoirs. Descriptions of the apportionments are presented in the following paragraphs.

b. Apportionment of Flood Control Costs. All costs allocated to flood control in the three proposed reservoir projects are apportioned to the Federal Government in accordance with flood control law. Construction costs of $36,294,000 and annual operation, maintenance and major repair costs of $66,000 are allocated to flood control and apportioned to the Federal Government.

c. Apportionment of Water Supply Costs. All costs allocated to present and future water supply storage in the proposed reservoir projects have been apportioned to non-Federal interests in accordance with provisions contained in the Water Supply Act of 1958 (Title III of Public Law 85-500). The amounts allocated to non-Federal interest for water supply at Lincoln and Patoka Reservoirs are summarized in the following tabulation. For details of these data refer to Tables 3 and 9, this Appendix.

Item	Reservoir	
	Lincoln 1/	Patoka 1/
Total construction costs	$ 33,000,000	$ 24,000,000
Allocated non-Federal costs	249,000	3,658,000 2/
Non-Federal construction cost as percent of total construction costs	0.75	15.24
Annual operation, maintenance and major replacement costs	0	10,000

1/ Current values

2/ After Area Redevelopment Act cost offset adjustment

d. Apportionment of Water Quality Control Costs. Water quality control is included as a project purpose at the proposed Lincoln and Patoka Reservoirs. Because of the widespread benefits to be realized from water quality control releases from the reservoirs, all costs for storage for water quality control in the proposed Lincoln and Patoka Reservoirs have been apportioned to the Federal Government according to the provision of the Federal Water Pollution Control Act, Amendments of 1961. These costs are summarized as follows.

Item	Reservoir	
	Lincoln	Patoka
Construction costs	$ 665,000	$2,438,000
Operation, maintenance and major replacement costs, annual	1,000	6,000

e. Apportionment of General and Fish and Wildlife Costs. In accordance with the provisions of the new "Change in Cost-Sharing Policy for Recreation and Fish and Wildlife in Survey Reports", established by Section 1(c) HR 9032, 88th Congress, all costs for general and fish and wildlife recreation have been allocated to the Federal Government, and no cost sharing is required for inclusion of these measures at the three reservoirs. Details on the determination of this conclusion are given in Table 12 of this Appendix.

f. Apportionment of Area Redevelopment Act Effects. The value of wages paid for construction of the proposed Lincoln and Patoka Reservoirs, to persons who would otherwise be unemployed and who live in ARA reservoir counties within commuting distance of the reservoir projects is apportioned to the Federal Government and thereby reduces the construction costs allocated to the various features included in the projects. A detailed summary of these payments is included in Section II of Appendix A.

A summary of apportioned construction costs and annual operation, maintenance and major replacement costs to Federal and non-Federal interests is presented in table 13.

TABLE 12

COST SHARING FOR RECREATION AND
FISH AND WILDLIFE ENHANCEMENT
HR. 9032, Sec. 1(c) 88th Congress

Item	Reservoir ($1,000) Lincoln	Clifty Creek	Patoka
1. Joint use costs (Lands and facilities)			
a. Total construction costs	$ 33,000	$ 15,900	$ 24,000
b. Total, specific lands and facilities	5,263	3,957	5,873
c. Total joint-use lands and facilities	27,737	11,943	18,127
2. Allocated Construction Costs of Lands and Facilities for Recreation and Fish and Wildlife Enhancement			
a. Specific costs	5,263	3,623	5,873
b. Joint costs	4,221	1,368	3,719
c. Other costs	0	0	0
d. Total	9,484	4,991	9,592
3. Cost Sharing Under HR 9032			
a. Non-reimbursable Federal costs			
(1) Specific costs	5,263	3,623	5,873
(2) Joint costs	4,263	1,368	3,719
(3) Limit on joint costs	5,148	2,791	3,719
(4) Other costs	0	0	00
(5) Limit on other costs	5,000	2,791	4,532
(6) Total non-reimbursable Federal costs	9,484	4,991	9,592
b. Reimbursable Non-Federal Costs			
(1) Excess of joint costs over limit	0	0	0
(2) Excess of other costs over limit	0	0	0
(3) Total reimbursable non-Federal costs	0	0	0

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TABLE 13

APPORTIONMENT OF COSTS

Item	Federal Costs					Non-Federal water supply	Total allocated costs
	Flood control	Water quality control	General & F&W recreation	ARA cost offset	Total Federal		
	Construction Costs ($1,000)						
Lincoln Reservoir	20,775	665	9,089	2,223	31,751	249	33,000
Clifty Creek Reservoir	10,909	-	4,991	-	15,900	-	15,900
Patoka Reservoir	6,367	2,438	9,592	1,945	20,342	3,658	24,000
Totals	38,050	3,103	24,672	4,168	68,993	3,907	72,900
	Annual Operation, Maintenance and Major Replacement Costs ($1,000)						
Lincoln Reservoir	32	1	236	-	268	-	268
Clifty Creek Reservoir	38	-	162	-	200	-	200
Patoka Reservoir	19	6	276	-	301	10	311
Totals	88	7	674	-	769	10	779